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MAY 1943

MECHANIX ILLUSTRATED

VOL. XXX NO. 1

W. H. FAWCETT, Jr., President

Editors: Roland Cueva Bill Williams

Associate Editors: George Daniels, *Aviation;* Norman C. Lipton, *Photography;* Thomas J. Naughton, *News;* Mary Driscoll, *Production.*

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SPECIAL FEATURES

On the Cover: This is the first Kodachrome ever published of the newest version of Igor Sikorsky's great VS-300 helicopter—forerunner of the family plane of the future. For story and more pictures, see page 58. MECHANIX ILLUSTRATED Kodachrome by Norman C. Lipton.

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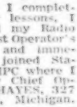

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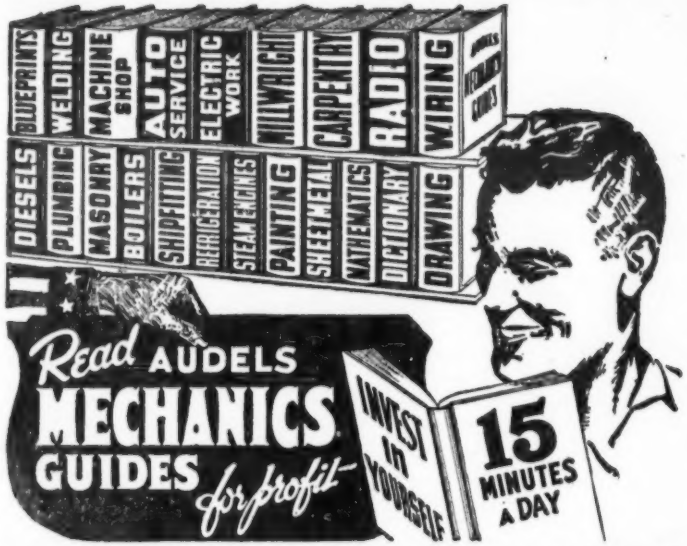

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Conducted by

JOSEPH H. KRAUS

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Increasing Effectiveness of Guns

Harold Bradley, Atlanta, Ga., outlines to us some of the difficulties he has had in attempting to get an expression of opinion on ideas which he claims he submitted to several governmental agencies.

He writes: "I would like your candid and unbiased opinion on this point. Even if erosion did cause a great deal of wear in the gun" (Bradley's design), "would not its greatly multiplied range and striking power, its ease and economy of manufacture and ease of repair or substitution of repair parts outweigh the disadvantages and warrant the use of such a gun?"

ANSWER: *It is impossible to answer either negatively or affirmatively the inquiry as put. You have not disclosed the construction of the gun; consequently, it is merely your opinion of advantages with no evaluation of disadvantages.*

You must remember that in order to tool up for the production of a new design manufacturers probably must set up entirely new equipment. The gun must be given a thorough test; the crews must be trained in its use and repair. All of these factors must be weighed as a concrete whole. We are of the opinion that the first requirement is proof that your gun will do what you claim for it.

If the modification is as simple as you outlined it should be possible to modify an ordinary rifle, load it with a regular bullet and demonstrate the penetrating power of the new design in comparison with a bullet fired from a similar but not modified rifle. To us that would represent tangible proof that your design will do what you claim for it. The factor of increased erosion can then be considered.

We would recommend that you build or have such a model built according to your specifications and prove its value.

Thermostatic Radiator Controlled Valve

Lester Kelner, Philadelphia, Pa., submits a suggestion for a solenoid-operated radiator valve, controlled through a thermostat.

ANSWER: *This suggestion is not new. Furthermore, it is too complicated for general use. Unquestionably, there would be a good market for a simple, thermostatically controlled, non-electric radiator valve which would be inexpensive and could be substituted easily for the valves now found on steam and hot water radiators. We suggest you work along those lines.*

Airplane Landing Strip

Sebastian Calvo, Waterbury, Conn., recommends that a moving belt type of landing strip be arranged on small fields. This strip would be moved by a high-speed motor. As the plane settles down its wheels would make contact with the moving belt and the plane, says Mr. Calvo, should come to a quick halt.

He also suggests a modified 5-gallon can for use in oil heaters.

ANSWER: *It is not sufficient merely to move the landing strip to bring a plane to a quick stop. It would be necessary also to move a similar mass of air at the same speed. Although this might be accomplished by an air tunnel, it is certainly not a practical way of bringing the plane to a quick stop on a small field. We do not consider the idea practical.*

The suggestion for the substitute oil heater can is not practical, in our opinion. Glass is always subject to breakage; hence, dangerous. If covered by metal it will defeat the purposes for which the modification was intended; nor do we think that the substitution of any other commonplace material is a patentable item. But you should check with your attorney on this point.

Automobile Ash Tray

Clarence Gascayne, East Aurora, N. Y., presents an idea for an automobile ash tray with a chute through which the ashes can be dumped automatically on to the road.

ANSWER: *As the suggestion stands it is neither new nor novel. It has been employed on automobiles and also on railroads. Unfortunately, there is no convenient way in which such a tray can be arranged on the dash of the modern automobile because any connecting tube would interfere with roominess.*

We are of the opinion that the ashes and

[Continued on page 133]

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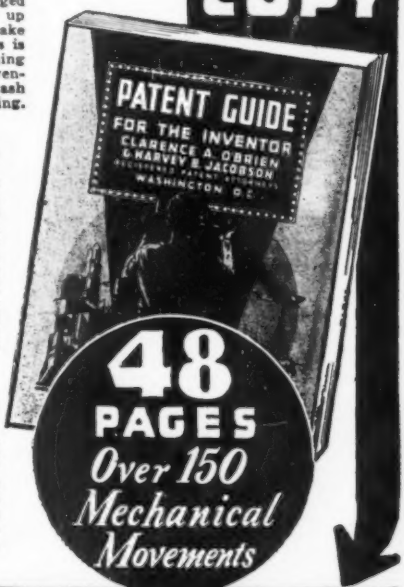

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CHIPS *from the* EDITOR'S WORKBENCH

The Contest

FROM the manner in which the first entries in the Third Annual MI Contest are arriving, it would appear we are going to be swamped this year. The final puzzle in the "Buildwords" Contest appeared in the April issue of MECHANIX ILLUSTRATED, you know. The deadline was extended until April 15, however, and so—at this writing—it will be some time before the last of the eligible entries reaches this office.

The judges of the contest are going to see to it that every entry gets fair and honest consideration. We can assure you that every single properly addressed and mailed entry will receive individual attention. Since this is our third annual contest of this nature, we have the experience necessary to set up proper organization for handling the flood of entries.

So, if you are a contestant, please take all of these factors into consideration and dð not become impatient. We can promise you that the winners will be announced in the *earliest possible issue.*

Incidentally, we have been informed by Whizzer Motor Sales Co., 9000 Sunset Blvd., Los Angeles, Calif., that the Whizzer direct drive bicycle motor which is fourth prize in the contest is priced at $89.50, instead of $59.95 as first published. From mail we have received, there are hundreds of hopeful contestants planning to win it.

"Miss Priority"

THERE'S a real treat in store for MI's boat fans. And we aren't kiddin'!

The June issue will bring you plans and instructions for building a small non-priority sailboat designed by William F. Crosby, whose name is a household—pardon us, shipboard word to

[*Continued on page* 16]

Motorcycle policeman Henry J. Kohout, of 118 Overbrook Blvd., Pittsburgh, Pa., built this wood-turning lathe from plans in MECHANIX ILLUSTRATED. He's made 5 night sticks on it, proving that it can handle practical everyday work. The lathe certainly appears to be well made, judging by the photograph, and it brings its builder this month's Workbench first award of $5.00, and a Certificate of Merit.

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Editor's Workbench Chips

[*Continued from page* 14]

American boaters, and has been for many years.

Bill is now chief engineer of the Huckins Yacht Corporation and is busy turning out PT boats and other naval craft for Uncle Sam; nevertheless, he has found time to design this boat exclusively for MI, and is going to build it for his own amusement.

For more years than we can remember Bill was editor of RUDDER magazine, and his influence on the trend of pleasure boating in the United States has probably been greater than that of any other single individual. He's really the father of modern small sailboat racing through his designing of the *Snipe* and development of the *Snipe Class Association*. Second only in fame to the *Snipe* are his National One-Design, *Sea Gull* and *Mallard*, the latter two cruising sailboats.

Needless to say, we're highly honored to be able to present Bill Crosby to MI readers, and we know you'll like his opener, which he has dubbed "Miss Priority." Watch for them in the June issue.

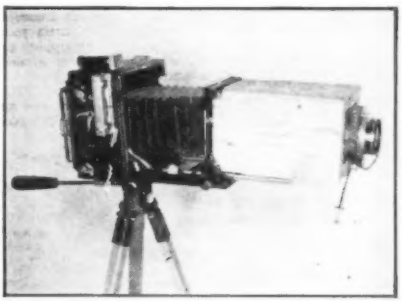
Convertaplane

IN THIS issue (starting on page 58) you will find Igor Sikorsky's intriguing article, "You Can Fly My Helicopter," bringing you the latest, up-to-the-minute developments on his new "flivver of the sky." But the helicopter isn't the only strange new flying machine shaping up for production after the war, by any means.

One of the most interesting new types of flying machines now being tested for possible post-war production is the "convertaplane," invention of Gerard P. Herrick, noted aeronautical engineer. The convertaplane is half helicopter, half airplane. One of the criticisms of Mr. Sikorsky's helicopter is that it will not attain a speed greater than possibly 150 miles an hour. Mr. Herrick's converta-

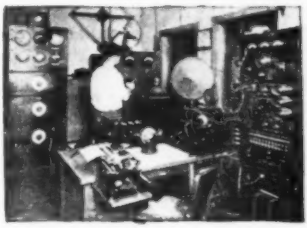
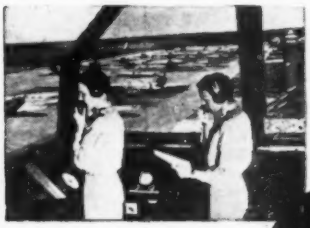
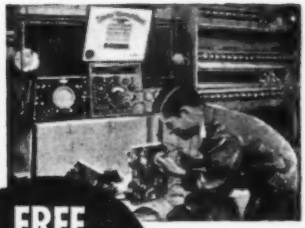
[*Continued on page* 18]

FOR CLOSE-UPS



This close-up attachment takes a lens of longer focal length than the one originally fitted to the camera. Its builder, T/Sgt. Leo H. Gille, 327th Base Hq., and Air Base, George Field, Lawrenceville, Ill., now gets the degree of perfection in his close-up photos that he wants. He also gets a $3.00 Workbench award and a Certificate of Merit.

BE A RADIO TECHNICIAN

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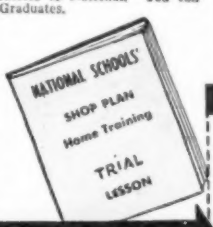

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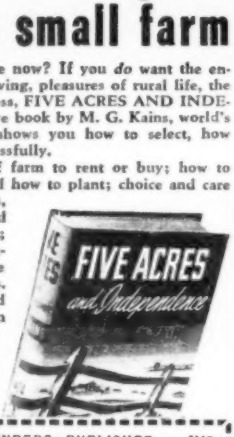

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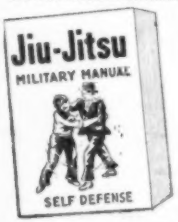

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Editor's Workbench Chips

[*Continued from page* 16]

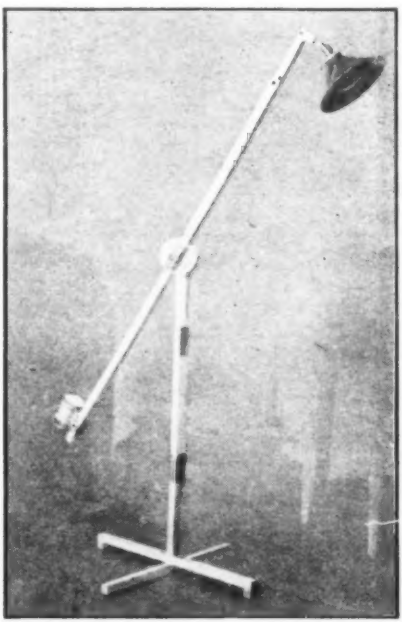
plane has an upper wing which acts as a rotor to make the plane rise almost vertically. Once in the air, this wing becomes fixed, like an ordinary airplane wing, and the planes speed forward in the same manner that a biplane does. As a result, it should be possible to attain much higher speeds with a convertaplane than with the helicopter.

In the first comprehensive article on the convertaplane ever to appear in a national magazine, MECHANIX ILLUSTRATED will present next month an article by Mr. Herrick, the inventor, bringing you full details of this interesting new aeronautical development. Be sure to get the June issue.

Incidentally, the kodachrome of the Sikorsky helicopter appearing on the cover of this issue was taken by Norman C. Lipton, MI staff photographer, and is the first color picture of the helicopter ever to be published.

The June issue of MECHANIX ILLUSTRATED is going to be packed full of so many outstanding features that we have room here only to list a

PHOTO BOOM LIGHT



Elliott S. Wilbur, 61 Elmwood Drive, East Paterson, N. J., built this model of the "Adjustable Boom Light" from plans appearing in PHOTOGRAPHY HANDBOOK No. 11. Though he has become a camera fan very recently, Mr. Wilbur has had a running start in arranging indoor photographic lighting—thanks to the many sound arrangements that his boom light affords. $3.00 and a Certificate of Merit to Mr. Wilbur.

few of them. They're exciting, certainly:

An eye-witness story of how our troops and war machines met their test in African battle and passed with flying colors.

"Your Post-War Boat"—an exciting peek at the new boat models coming after the war.

"The Mechanix of Gypsy Rose Lee"—a look at the strange machinery found backstage at the theater—together with photographs in which Miss Gypsy Rose Lee somehow shows up.

"Radio In the War"—by Lester David. The story of the Signal Corps, and of the first Marine landing party on Guadalcanal, which stayed only a couple of hours, and never saw a Jap.

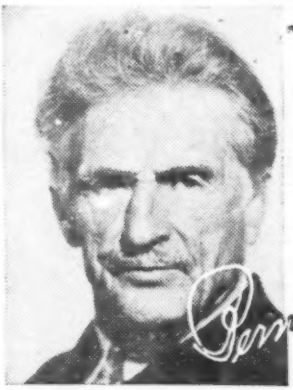
"They Call Him 'Ginger' "—the exciting story of Air Marshal "Ginger" Harris, chief of the British Bomber Command.

Plus many more features, hobby and how-to-build articles. Don't miss the June MECHANIX ILLUSTRATED!

Troubles

WHEN we say, "Don't miss the June MECHANIX ILLUSTRATED," we also mean, "better reserve your copy early at your favorite newsstand." The

[*Continued on page* 21]



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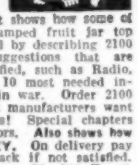

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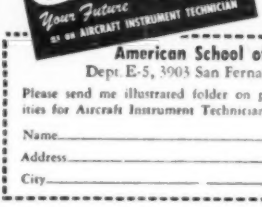

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Editor's Workbench Chips

[*Continued from page* 19]

reason for this is our new bugaboo, the paper shortage. The paper shortage, which already has forced publishers to curtail their use of paper by 10 per cent, results in fewer copies of MECHANIX ILLUSTRATED being printed each month. Consequently, if you want to be sure of getting your June copy of MECHANIX ILLUSTRATED, you'd better get to the newsstand early, or else make some arrangement with your newsdealer to reserve a copy for you.

In addition, the war has disrupted transportation seriously. War equipment and materials must move first, before magazines or anything else. Therefore, in many instances, your MECHANIX ILLUSTRATED is reaching your newsdealer later than usual each month. We ask you to have patience, under the circumstances. Do not expect MECHANIX ILLUSTRATED to be on the newsstands on the first of each month. Rather, look for it about a week to ten days later.

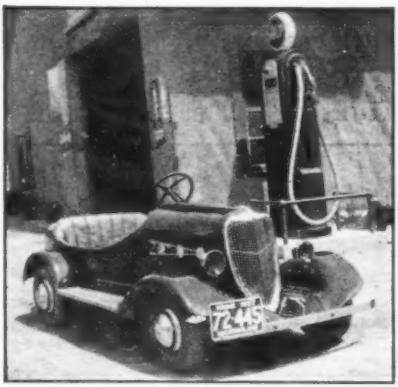
"Mark"

WE HAVE had several readers write to call our attention to what seems to be a strange fact: English tanks fighting in North Africa are called "Mark IV" tanks; also *German tanks* fighting in North Africa are called "Mark IV" tanks. Our correspondents ask, "What gives? Does the same company make both the English and the German tanks?"

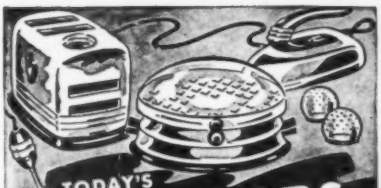
We can answer the question best, perhaps, by pointing out an even stranger fact: *American tanks* fighting in North Africa are also called

[*Continued on page* 23]

V-2 FORD



Frederick Peterson, Russel St. Extension, Lewiston, Maine, built this little version of a Ford car. All body work was done by hand, the entire car requiring 3 years of spare time for completion. Powered by a 2-cylinder outboard motor, it can attain a speed of 30 miles an hour. A $3.00 Workbench award and a Certificate of Merit go to Mr. Peterson for this photo of his trim little automobile.



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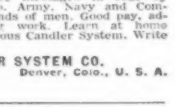

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Editor's Workbench Chips

[*Continued from page* 21]

"Mark IV" tanks! And, in addition, the noted Garand "M1" rifle with which U. S. troops are armed is properly a "Mark 1" rifle.

You know our American tanks as "M-3," "M-4," "M-1" and "M-5" tanks. Actually, the "M" in each case is an abbreviation for the word "Mark."

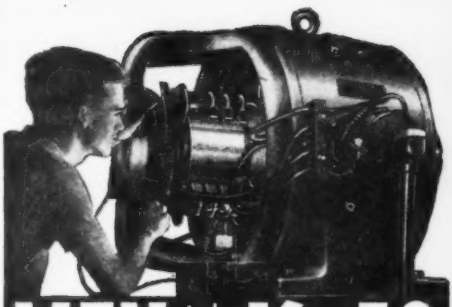
The explanation isn't nearly as sinister as the evidence sounds. The word "Mark" is not the name of a manufacturer. Actually, it is an ordnance term roughly equivalent to "model." When an army ordnance division accepts a design—of any type of weapon—that particular design is given a "Mark" and thereafter all weapons of that design are known by that "Mark." Hence the American "M-3" medium tank was really the third adaptation of a medium tank design for the U. S. Army. Later, when the "M-3" was redesigned to eliminate rivets in its turret, the new design became known as the "M-4," or "Mark IV."

The usage is world wide, and therefore we have the strange situation of English "Mark IV" and American "Mark IV" tanks fighting German "Mark IV" tanks—and all are different.

[*Continued on page* 25]

PHIL AND BILL BUILT IT

Philip M. Pfeffer, architect, of 4407 Shaw Boulevard, St. Louis, Mo., and his 13-year-old brother, Bill, built this trim little boat in 3½ weeks. Waterproof plywood, oak, and Masonite went into its construction. The hull is canvas covered. A $3.00 Workbench award and a Certificate of Merit go to Mr. Pfeffer.



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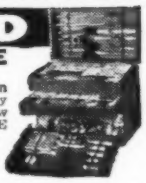

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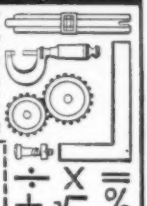

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Editor's Workbench Chips

[*Continued from page 23*]

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An adventurer at heart, Cooley has been interested in science since boyhood. He received his education at the University of Minnesota but became sidetracked from his first love for science by the discovery that he could write. After leaving school, he started his career as a free-lance, writing detective and adventure stories. His bent for science, however, attracted him to the publication, Modern Mechanix (later to become MECHANIX ILLUSTRATED). For five years he was editor of that magazine, but by that time his propensity for adventure began to assert itself again. So Cooley left the field of science writing to make his way to Tahiti, in the South Seas, on a tramp steamer.

In Tahiti, Cooley got his fill of tropical paradises

[*Continued on page 32*]

IT HAS A TWO-SPEED SHIFT

Merrideth D. Wilson, draftsman at Westinghouse Research Laboratories, East Pittsburg, Pa., bought this bike without a motor, but found the 10-mile pedal trip to work each morning was a little too fatiguing. He added the motor shown and a 2-speed gear shift. Now he gets to work under engine power. Speed is 30 miles an hour, fuel consumption, 100 miles to a gallon. This photo nets $3.00 and a Certificate of Merit.

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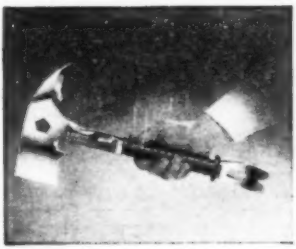

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Editor's Workbench Chips

[*Continued from page* 25]

after several months, and sailed for New York, to return once more to the bosom of science, as a special writer in that field. Soon he joined the staff of "Your Health" Magazine, since he had been specializing in medical subjects. Now, married and with one child, he is a settled resident of Westchester County, New York, and managing editor of both "Your Health" and "Your Life" magazines, doing considerable research and writing about general science subjects on the side.

Mind Bomber

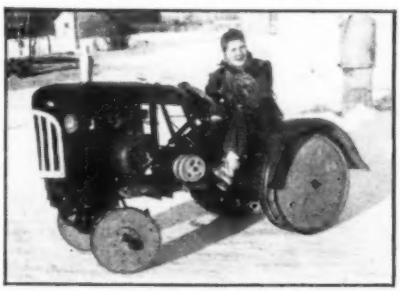
WE THINK you'd be interested in knowing a bit about another MI author appearing in this issue. He is Charles J. Rolo, whose article, "Bombs for the Mind," is found on page 42.

Mr. Rolo is a specialist in the field of radio propaganda and is the author of the new book published by G. P. Putnam's Sons, "Radio Goes to War." As one of the original staff members of the Princeton Listening Center, he monitored German, French and Italian short wave broadcasts and listened to some 10,000,000 words of foreign propaganda.

Born in Alexandria, Egypt, and educated at Oxford University in England, Mr. Rolo came to America for his Master's Degree at the Columbia School of Journalism. Aside from his work checking on Axis propaganda, he has contributed articles to a score of magazines here and abroad, including Harper's, Fortune, American Mercury, Current History & Forum, Coronet, etc. He has served as correspondent for papers in Egypt, as Associate Editor of Current History & Forum and as Radio Consultant to the Committee for National Morale.

Mr. Rolo's book, "Radio Goes to War," is the

PULLS A 12" PLOW IN 2ND



A little gasoline engine salvaged from a fire three years ago, provides the power for this handy little farm tractor built by Otto Neilson, of Erickson, Man., Canada. It has a top speed of 5 miles an hour in high, and enough power in first and second to pull a 12" plow. "It is fine in the potato patch," says Mr. Neilson. He gets a $3.00 Workbench award and a Certificate of Merit.

only popular account of the use of radio propaganda in warfare.

Book Note

ANOTHER MI writer, Major Malcolm Wheeler-Nicholson, who has a new article on page 46 of this issue, has just had a new book published by Crowell Publishing Company entitled, "Are We Winning the Hard Way?" It's a challenging book which has received many favorable reviews. It contains some material from his articles in MI.

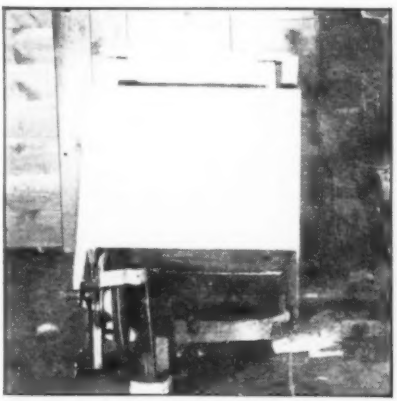
We're Starting On Adobe

AS WE swing into the second half of the series of articles on earth houses this month, we want to thank the readers of MI for their gratifying interest and for their many letters on the subject.

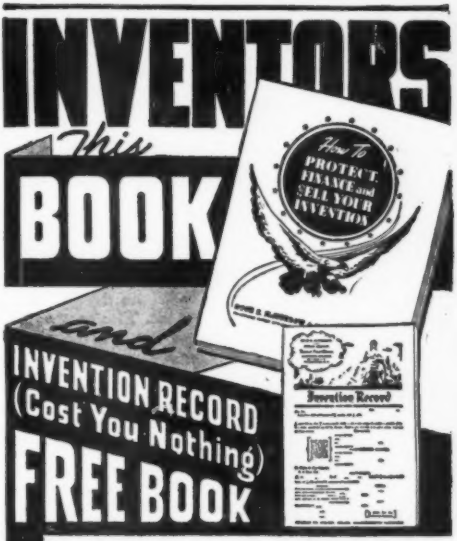
It seems as though lots of people were just holding off their home building plans until someone came along and told them about rammed earth dwellings. Well, we want to ask you to hold off just a little longer—until you've read this month's and next month's installments. Maybe you'll like adobe brick houses even better, particularly if you happen to live in the South, Southwest or California. They have several advantages over rammed earth houses, though in other respects they aren't as good. One thing in favor of adobe brick construction is that the work involved is easier—instead of banging

[*Continued on page* 158]

$10 FURNACE STOKER



George P. Stamm, of 3501 Osceola St., Denver, Colorado, is the builder of this $10.00 furnace stoker. Although made entirely from junk, it has thus far been entirely trouble-free in operation, requiring attention only once in twenty-four hours. About all you have to do is fill the plywood hopper with cheap stoker coal, and the junk-built stoker takes care of the fire for the next day and night. Mr. Stamm gets a $3.00 Workbench award and a Certificate of Merit.



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Win the War!

By W. H. FAWCETT, Jr.

President of Mechanix Illustrated

Right under our feet there is a fortune in buried treasure—not in gold but in health, energy and efficiency. But we've got to dig for it. And in the coming months we'll be doing more digging than we've done in years. The campaign for Victory gardens to make up shortages of fruit and vegetables is not a fad and not just a profitable hobby. It's a war necessity. By next fall we will begin to feel the pinch and if we are not careful our health is liable to suffer from a sudden shift in diet.

We don't have to set out a 40-acre field. Any plot of sunny, fertile ground at least 30 by 50 feet will do. And tomatoes are the most valuable crop we can raise. They contain all the vitamins and can be canned and used in so many different, tasty ways. Next comes the leafy vegetables—cabbage, kale, spinach and turnip greens. But tomatoes are a "must."

Write to the Department of Agriculture, Washington, D. C., today for their free bulletin called "Victory Gardens." It gives you full instructions. Even if you're a farmer by trade it will tell you many things you'll be glad to know. I've got my copy.

The war in the Pacific has made the galoshes situation very acute in the Fawcett family. Before the rubber sources of the orient were cut off we used to go through galoshes and overshoes at a great rate and we didn't worry much about it. But now I have become instructor in the art of the inner tube patch. It's amazing how much can be done to save household articles by patching before they have to be put in the scrap box.

Also we are taking care to stuff galoshes loosely with wadded paper and we keep them in a cool closet—we found that the closet by the front door had a steam pipe in the wall. And heat kills rubber quicker than anything else except oil and grease.

If someone popped the word "synergism" at us we might think he was talking about a food fad or a new religion in which everybody tried to be as big a sinner as possible. Actually it is an old word and has been used by scientists for years.

It means that forces working together produce a total greater than the sum of the parts. In human relations it means inspired cooperation: a good football team is a lot more than 11 times as mighty as any single man. From the team work comes a force that is new—what scientists call an "emergent factor."

This explains the tremendous power of modern industrial planning with its marvels of plastics and chemistry.

Slaves cannot produce synergism no matter how much they are terrorized. That's why we'll win the war.

The American Indian is famous as a fighter but few of us realize how the redmen have responded to the present war crisis. Long before Pearl Harbor they began enlisting in the Army. Today there are 8,000 serving in the armed forces—one-seventh of all male Indians of military age. Let's take our hats off to these real 100% Americans!

Are you a potential panic-starter? Psychologists tell us that we are liable to touch off a panic if we: 1) run at the sound of a loud noise, 2) scream when startled, 3) think only of ourselves, 4) make no effort to control our emotions, 5) pay no attention to advice of those in authority, 6) push, shove and trample when in a crowd.

So far we mainland Americans have never been attacked from the air. But if the Boston night club fire several months ago is any indication we had better get ready now to work out some "panic extinguishers."

The only way to cut down our panic-susceptibility is through discipline and training. Soldiers get plenty of this but for many of us this can only be gained by self-training and self-discipline. In practice black-outs we can take care to do as we are told calmly and without wise-cracking or grumbling. And every day there are a host of minute crises around the home which test our self-control.

If you don't rush madly about when the carrots are burning on the stove you will probably behave all right if the house catches fire.

If you see Junior hoisting himself over the edge of an open window and can hold back a scream the chances are you will be okay if the bombs start to drop over here.

W. H. Fawcett, Jr.

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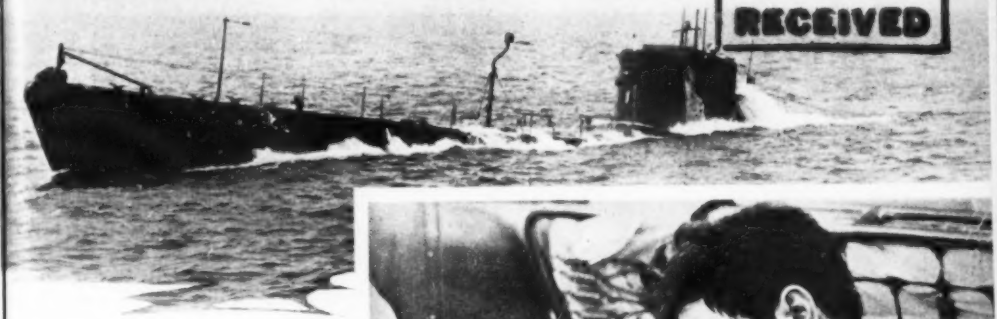


by
Wheeler B. Lipes

Wheeler B. Lipes was Pharmacist's Mate of a U. S. submarine operating in Japanese waters when one of his shipmates was stricken with acute appendicitis. No doctor was aboard or available. To save his friend's life Lipes, using improvised surgical equipment, guided only by his memory of a few appendectomies he had seen long before, successfully performed the necessary major operation—the first such operation ever known to have been done under such conditions. This is his own story of that desperate, life-saving surgery.

"The surgical steel cut through his side like a razor going through butter. For some reason or other, that thought stuck in my mind as I cut through the muscles."

A U. S. submarine isn't exactly the place to throw a big party, but all the fellows in the crew had planned on a surprise birthday celebration for Dean Rector. Dean, a big, handsome kid from Chautauqua, Kansas, was just turning nineteen. It was his first birthday at sea and the other fellows were getting quite a kick out of making all the arrangements. The cook even baked a special cake for him.

But the fellow who made that remark about the best-laid plans going cockeyed certainly knew what he was talking about. On the day that we were going to throw Dean his party, we were cruising off the Japanese coast, looking for a chance to get some of our torpedoes into Jap shipping. I was the pharmacist's mate on the sub, and I was killing time in the crew's space, when one of the other boys came looking for me.

"Hey, Lipes," he said, "something's the matter with Dean. He's stretched out in his bunk and he looks pretty sick."

I went to Dean as fast as I could. That sailor hadn't been fooling. Dean didn't look like the same kid. His face was pale, and he was twisting and turning with pain. He had both hands clamped to his right side, as though he were trying to force his stomach in. I didn't like the looks of the thing at all.

During my training, I'd learned the symptoms of acute appendicitis; Dean had them all.

Inside a submarine there is no space to spare. Lipes had to perform his operation in the officers' wardroom—"about as big as a closet."

I'd seen a couple of cases of it when I was at the Naval Hospital in Philadelphia, studying for my Pharmacist's Mate rating, and Dean's looked exactly the same as they had. But if he had acute appendicitis, he needed an operation, and he needed one right away. And there wasn't a naval surgeon within 4,000 miles!

I tried to keep Dean quieted down but he couldn't help moaning, almost crying. "Can't you do something?" he kept saying.

I told him the truth. I said, "Dean, you need an operation right away or else it's too bad. But there isn't a doctor within 4,000 miles. It's a tough spot."

Dean understood everything I said. He waited until I finished telling him how things stacked up and then he said, "Well, don't just let me die here. Try something. Anything you want to do is okay with me."

The kid had plenty of guts. Hearing him say that really gave me the courage to do the operation myself. As I said before, I remembered seeing some operations for appendicitis and I thought I could do the same thing. I had to get permission from the skipper, though, so I explained to him that it was a question of life or death for Dean. The skipper thought it over for a few minutes; then he gave me his okay and we really started some fast moving.

We began almost from scratch. Except for some ether and a broken scalpel, we had nothing on board with which to operate. It was like trying to torpedo a Jap warship with a machine-gun.

First, I gave Dean all the preoperative care I could. I found we needed a lot of things, such as an ether mask, and retractors to keep the incision open. It's a good thing our fellows were handy and that you get used to improvising aboard a submarine; or else we couldn't even have started the operation. The only rubber gloves I could find were about three sizes too big.

While we began our preparations, the skipper said he thought the sub's rolling motion was too much on the surface so he finally leveled off at 120 feet, keeping just enough headway to hold her steady against the current. In the meantime, we raided the cook's pantry for our surgical equipment.

We borrowed a tea strainer and I wrapped it in gauze to be used as an ether mask. It certainly wasn't what you'd get at Johns Hopkins, but I thought it would serve the purpose. Then we took the scalpel blade and made a handle for it out of a blood vessel pincer. We had to hit the cook again for retractors; his monel metal tablespoons were just fine when we bent them at right angles.

It was a tough job figuring out what we'd use for antiseptic

Continued

I WAS A HANDYMAN SURGEON

and sterilizing. Then I remembered we had sulfanilamide tablets aboard so I had them ground up into powder for an antiseptic. The torpedoes we were saving for the Japs gave us alcohol for sterilization. In the mechanism at the end of each torpedo, there is a chamber which has alcohol in it. We just milked it out.

When we got everything ready, I had Dean carried into the officer's wardroom, which I decided would be our best operating room. It's about as big as a large-sized closet, with a table occupying practically every inch of space. Dean was a little too big for this table, so that when we laid him on it his feet hung out over its edge. We took a drawer out of a bulkhead cabinet and stood it up on end, where his feet could rest on it.

As the moment to get going came around, I kept wishing I was about a thousand miles away. I wasn't exactly nervous, but I could feel a large vacant spot in my stomach. If a naval surgeon had walked into the wardroom at that time, I would have signed over three years' salary out of sheer relief.

Before we got started, the skipper, Lieut. Commander W. E. Ferrall, of Pittsburgh, asked me to explain the setup again to Dean, so I reminded the kid that I had never done an operation before. "But you don't have much chance to pull through anyhow," I told him bluntly, "so what do you say?"

Dean tried a grin and answered, "Okay, Doc, let's get moving."

It was damned hot in that wardroom. We were using one of the big floodlights which are used ordinarily for night loading and it made everyone perspire plenty, even though we had nothing on but reversed pajama coats and the sub's blowers were going. It doesn't seem like much to write, but that moment I hesitated before beginning the operation seemed the longest one I ever want to live. Everyone seemed to be looking intently right at me. I kept thinking, "What if the tea-strainer mask doesn't work? How good is the torpedo alcohol? What if a depth bomb hits us?"

I soaked my rubber gloves again in the alcohol and when I caught Dean trying another grin, I gave the signal to Lieut. Franz Hoskins, of Tacoma, Washington, who was acting as anaesthetist. I watched the mask go over Dean's face and his breathing became short and quick as he tried to fight it at first. There wasn't a sound in the whole submarine, except the purring of the electric batteries as they maintained enough power to keep the submarine on an even keel in the current, 20 fathoms down, and the suddenly loud ticking of the wardroom clock.

I knew from anatomy where to start. I placed my little finger on Dean's subsiding umbilicus, put my thumb on the point of the hip bone and dropped my index finger straight down. Then I made the incision. The scalpel was good and sharp and the surgical steel cut through his side like a razor going through butter. For some reason or other, that thought stuck in my mind as I cut through the layers of muscles.

Below: Pharmacist's Mate Lipes shows his wife the kind of tools out of which he fashioned instruments for his undersea appendectomy. "Rector," he says, "had courage."

Wheeler Lipes demonstrates how he figured out where to make the incision in Dean Rector. Rector, fully recovered, was back at his post aboard the submarine in 18 days.

As I cut deeper, Lieut. Norvell Ward of Indianhead, Maryland, who was acting as my assistant, placed some of our bent tablespoons in the incision to keep it open. Someone got sick in the operating room. It turned out later it was from the smell of the ether and the heat and watching the operation. He was taken out of the room and I didn't even know it.

All the time I was cutting, I kept thinking about the rubber gloves. I remembered when I first put them on, someone made a wisecrack about my looking like Mickey Mouse. I just prayed that they wouldn't get in my way. It was damn tough, like trying to do fancy needlework while wearing a pair of boxing gloves.

Finally, from the details I had racked my brain for, I knew I had reached the approximate location of the appendix. I was in what is known as the blind gut, where the large intestines start. There's no other way to describe my search but to say I fished around for the appendix.

As I probed, I noticed that Dean's face was beginning to move. I mumbled through my gauze mask. "Give him some more ether." It was a good thing that the operation had got so far before the effect of the first anaesthetic began to wear off for the ether was almost gone. It seemed to me I groped for that appendix for hours. I almost cried as I struggled against the clumsiness of those oversized gloves, knowing that our last bit of ether had been used up, and if Dean came out of it again there wouldn't be a thing in the world we could do. Every tick of that wardroom clock beat on my ears like a hammer. Fighting against the heat and nervous strain, I bit my lip hard and kept hunting. At last I found it. With a ten-cent pair of manicurist's scissors I snipped it off. Then I made sure everything was as sterile as possible, removed our tablespoons and sewed up the incision with 20-day chromic catgut sutures.

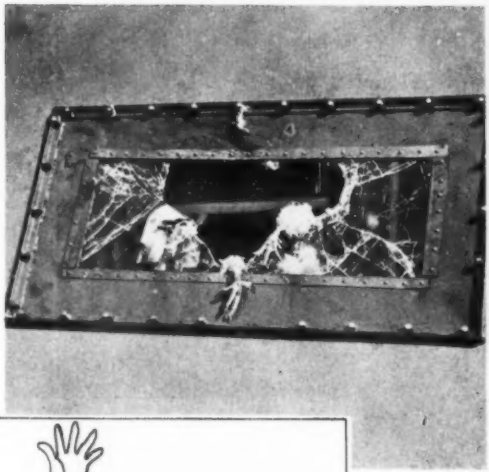
As soon as that was finished, I had Dean carried to one of the officer's bunks. I was scared stiff. I went over every step of the operation in my mind, trying to make sure that I hadn't forgotten anything which might prove disastrous. I don't remember much of anything that happened for the next half-hour, as I sat beside Dean. Then I noticed his face beginning to work. Finally he opened his eyes, looked around for a minute, and, with that same swell grin, said, "I'm still in there pitching." That was the greatest speech I ever expect to hear.

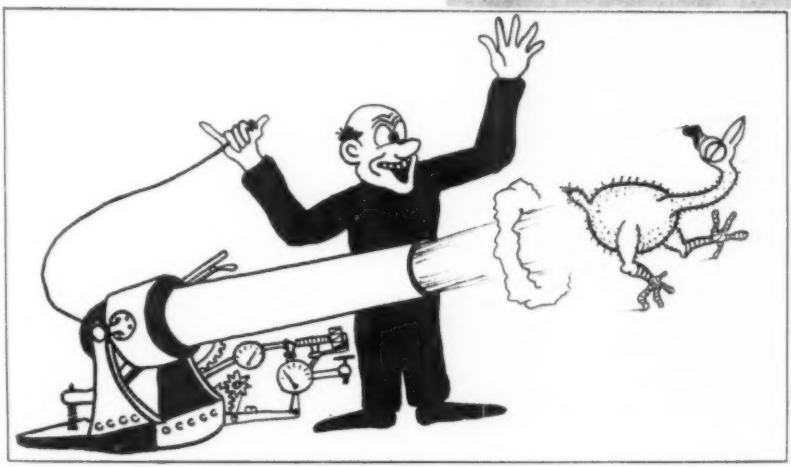
The whole operation, not figuring the time we spent on improvising our operating tools, took about two hours. I know that an appendectomy usually requires about forty-five minutes, but, for the life of me, I don't see how we could have speeded it up any at that time.

Dean improved rapidly while the submarine went about its regular business of patrolling the seas looking for Jap ships. He was back at his post in exactly eighteen days—minus one appendix. [*Continued on page* 147]

GIVING WINDSHIELDS THE BIRD

IF YOU had to build an airplane windshield that would withstand the impact of a bird hitting it at, say, 400 miles an hour, how would you test it? Well, that's exactly the way Westinghouse engineers test theirs. They stuff a deceased chicken into a 20-ft. compressed-air cannon, *above*, and shoot it at a test windshield. *Right*, a windshield that wasn't up to the requirements. *Below*, our artist's version of this experiment. (He has since been put back in his straitjacket.)





Make Your Own

PHOTO CHARADES

"Down in the Mouth"

by Roland Cueva

ON THESE two pages MECHANIX ILLUSTRATED presents a puzzle-game on which it has no monopoly—one with which you can have plenty of fun and camera practice yourself. Here's the idea: each of these pictures represents some well-known phrase—not necessarily a proverb, though proverbs aren't barred; you figure out, from the pictures, what the phrases are. To take an obvious example: a picture of a man standing on a world-globe would represent "On Top of the World"; "Nose to the Grindstone" would be another easy one. These aren't quite so simple as that, but you should be able to get at least three of them on your first try. To check your answers, turn the page upside down; if you get as many as five correct without peeking, you're good; six, very good; seven, excellent; and if you get all eight, you're a genius!

Good luck!

Close Call

"Punching the Clock"

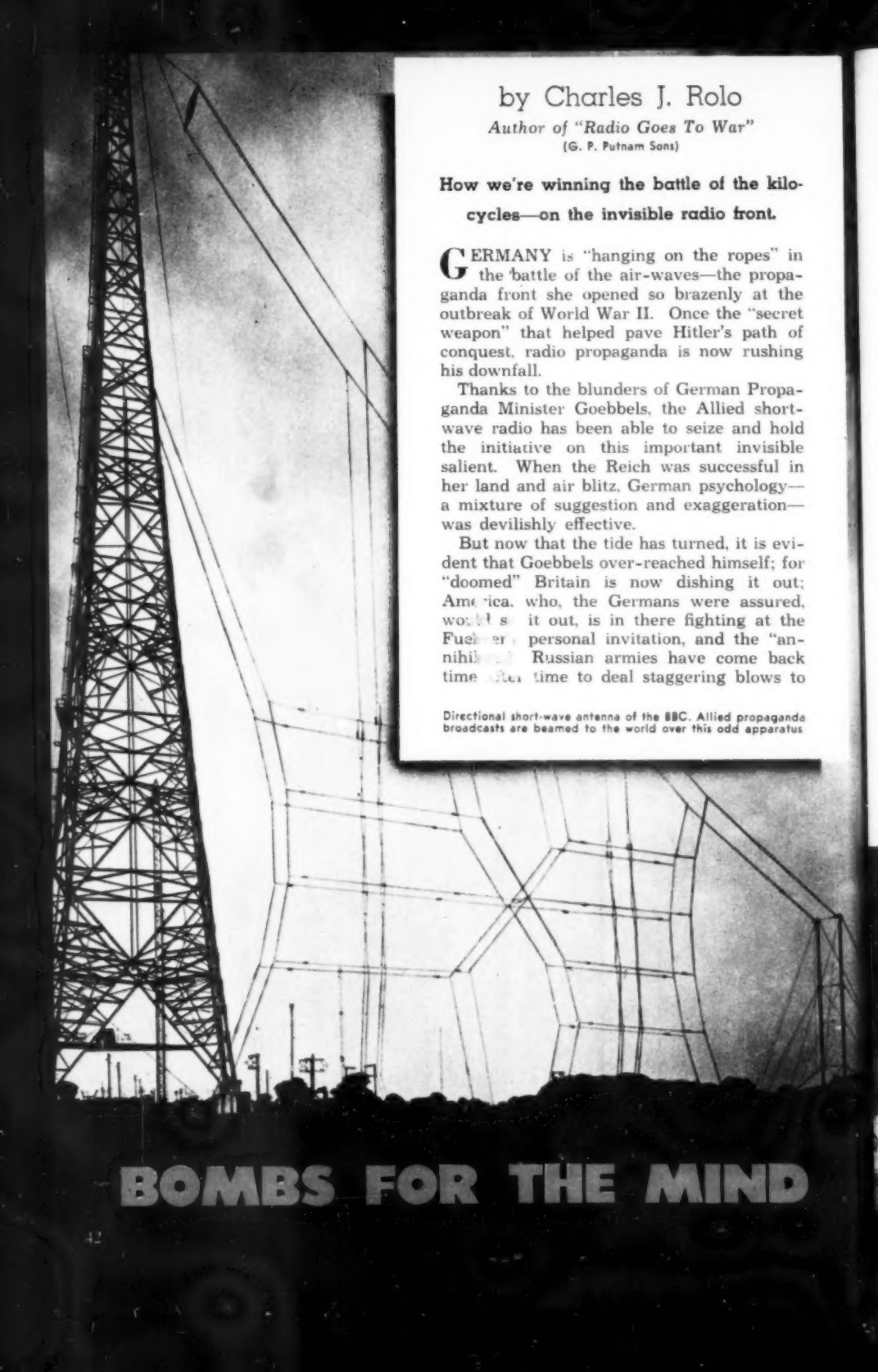
"Shot in the Dark"

"Drink on the House"

"Walking the Plank"

"A Stitch in Time"

"Pot-Shot"



BOMBS FOR THE MIND

by Charles J. Rolo

Author of "Radio Goes To War"
(G. P. Putnam Sons)

How we're winning the battle of the kilocycles—on the invisible radio front.

GERMANY is "hanging on the ropes" in the battle of the air-waves—the propaganda front she opened so brazenly at the outbreak of World War II. Once the "secret weapon" that helped pave Hitler's path of conquest, radio propaganda is now rushing his downfall.

Thanks to the blunders of German Propaganda Minister Goebbels, the Allied short-wave radio has been able to seize and hold the initiative on this important invisible salient. When the Reich was successful in her land and air blitz, German psychology—a mixture of suggestion and exaggeration—was devilishly effective.

But now that the tide has turned, it is evident that Goebbels over-reached himself; for "doomed" Britain is now dishing it out; America, who, the Germans were assured, would soon be knocked out, is in there fighting at the Fuehrer's personal invitation, and the "annihilated" Russian armies have come back time after time to deal staggering blows to

Directional short-wave antenna of the BBC. Allied propaganda broadcasts are beamed to the world over this odd apparatus

the *Wehrmacht*. Goebbels' prestige in Germany has gone bankrupt.

Meanwhile, the United States, Britain, and Russia have stepped up the output of their giant radio transmitters to keep Hitler-held Europe under a 24-hour a day "information" and propaganda barrage—broadcast in more than a score of languages.

A Nazi writer has called these programs "bombs for the mind," and Hitler agrees, for the penalty for listening to Allied broadcasts is death or the concentration camp. In spite of this, thousands (perhaps millions) of men and women, in the occupied countries and *in Germany* continue to defy the Gestapo by listening.

Best proof of the effectiveness of the Allied broadcasts are the persistent efforts of the Nazi radio to "answer" British and American stations on the German home service. In fact, Hermann Goering himself recently made the following strange appeal to the German people: "Don't always believe what you are told. Let us refuse to accept all enemy propaganda."

Further evidence of the extent of bootleg listening comes from underground intelligence sources and letters that have continued to seep through the dykes of Nazi censorship into U. S. studios since Pearl Harbor. Most dramatic response was to a half-minute request by NBC's French speaker, for the names and addresses of war prisoners to whom listeners wanted Red Cross food packages sent. Within a month, NBC received 1,500 letters.

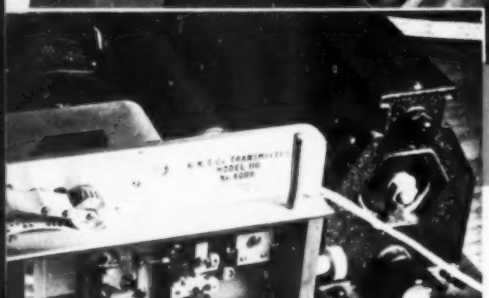
In Italy, American broadcasts are known to have a large following. Many Fascist officials have been smartly rapped over the knuckles by Party big-wigs for passing items on to their wives, who then spread the news in shopping line gossip.

Even in Poland, U. S. Radio has a scattered audience. One of the last American correspondents to leave Europe tells of a janitor of a large Warsaw apartment building who makes a handsome extra income from his tenants for giving them a daily report of the news he picks up on a short-wave receiver hidden in a cellar coal bin. This Warsaw janitor is one of a large army of "intellectual guerrillas," who depend on British and American broadcasts for verbal ammunition with which to fight the Nazis. Some spread the news by word of mouth, others through the underground press.

To the editors of Europe's several hundred clandestine newspapers, the British Broadcasting Corporation transmits, in the small hours of the morning, special bulletins in

Above: Edward Kulikowski, broadcasting in Polish over the CBS short-wave.

Left: Speeches by Nazi leaders are filed in this large BBC record library.



Above: Sorting part of the heavy volume of mail that reaches NBC's International Division every day. *NBC Photo.*

Left: A BBC Morse Code transmitter used for daily broadcasts to European underground newspapers. *BBC Photo.*

Morse Code, which defy "jamming." Half an hour of news, each word repeated, is tapped out slowly in German and several other European languages. Patriots throughout conquered Europe transcribe these bulletins and issue them from obscure hideaways so that the Allied news of the day reaches the farthest rural hamlets by the following day.

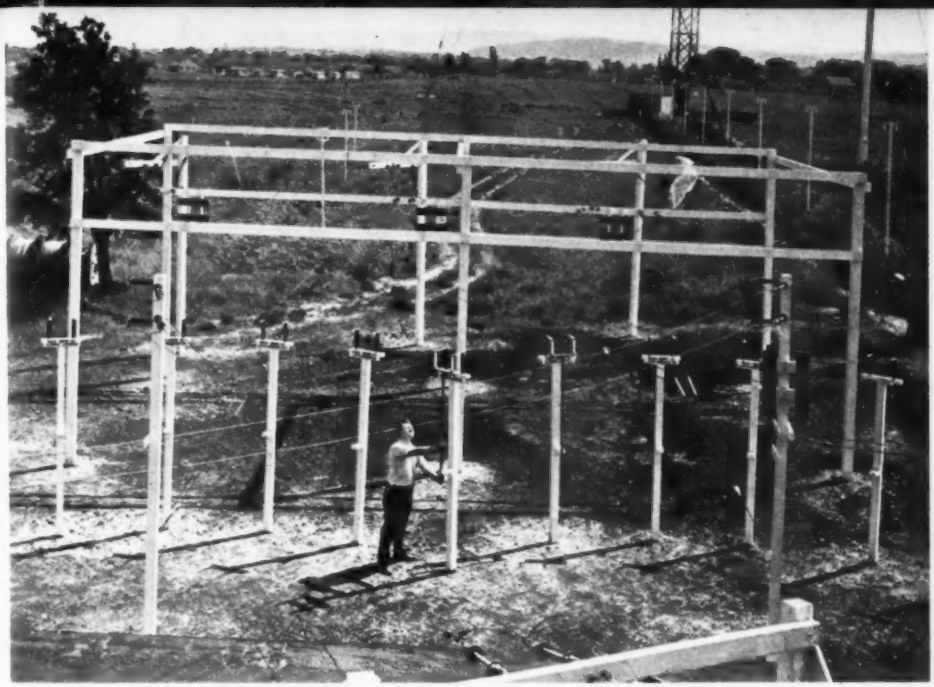
In our radio war against the Axis, news is the No. 1 weapon. The United States pours into Hitler-held Europe more than 1,000 newscasts a week, plus reviews of editorial comment and reports on the achievements of American production.

All overseas propaganda, excepting to Latin America, is now handled by the Office of War Information, with playwright Robert Sherwood in charge of radio operation. Last November, the U. S. Government leased the facilities of the country's private short-wave stations, which between them mustered thirteen powerful transmitters. So important is this offensive against the Axis that twenty-two additional transmitters are now under construction. It has been dubbed the "fourth arm" of our war effort.

Short-wave can only hope to reach a very limited audience. Accordingly, an increasing number of U. S. programs are being rebroadcast from England to the continent on the standard wave-band through the cooperation of the BBC. The OWI also relays programs to its outposts in North Africa, Chungking, and Australia, where they are

Continued

BOMBS FOR THE MIND



A device of the General Electric Company used to beam propaganda broadcasts to various parts of the world. The man in the foreground is adjusting the direction finder on the Europe-London broadcast antenna.

rebroadcast locally. In this way, U. S. overseas transmissions are heard by millions of radio listeners.

For the job of fighting the Axis on the kilocycles, the OWI has assembled a force of 1,600 persons, in addition to the full personnel of the private short-wave stations. The men and women who speak for Uncle Sam at the microphone, the "shock troops" of the radio front, have been recruited from the most improbable professions. They have been soldiers and poets, engineers and musicians, business men and show folk, diplomats and explorers, professors and journalists.

One of the veterans of U. S. radio's "Foreign Legion" is NBC's Italian-language speaker, Natali Danesi—a former actress-correspondent who used to write for Italian newspapers while playing on Broadway. According to a reliable informant from Italy, several members of the Italian General Staff, rely on Miss Danesi's broadcasts for accurate news from the war fronts.

Klaus Lembrecht, one voice of CBS' German service, was for three years an active member of the German underground and escaped to Switzerland with the Gestapo at his heels. Ernest Applequist, who speaks to Sweden, made his first bid for fame as a high diver on the Swedish Olympic swimming team. Edward Kulikowski twice daily sends news into the blackout of conquered Poland. A former member of the Polish diplomatic service, he has fought in two wars and has twice escaped from German prison camps.

One of U. S. Radio's toughest problems was to find a team that could be trusted to speak to the Arab World—a critical assignment since the Allies landed in North Africa. One of the candidates, who loudly proclaimed his loyalty to the Allies, was found to be a close friend of the Grand Mufti, who is frequently Hitler's honored guest in Berlin. Columbia's difficulties were solved by the discovery of Dr. Clement Dorra, formerly one of the leading physicians of Alexandria, Egypt, who arrived here in 1940 and in the record time of five months qualified for U. S. medical practice. Dr. Dorra sidesteps the problem of Arab dialects, which are legion, by using *Nahawi*, the language of the Koran—understood from Casablanca to Constantinople and the Persian Gulf.

In kilocycle warfare, it is possible to win and lose battles just as on the land, air and sea fronts. For [*Continued on page* 150]

A PLAN

1 As in classical war strategy, this attack would open with bombardment done at long distance by bombers.

2 "Aerial cavalry," in form of fighter planes follow bombers, strafing the defenses in mass.

3 "Aerial Marines"—paratroopers—next arrive to seize a beachhead, as in classical war.

PICTURE STORY CONTINUED ➡

FOR TRUE AIR POWER

With only the planes we now have in service, this military expert's scheme would enable a real, all-out air assault!

by Major Malcolm Wheeler-Nicholson

Illustrations by Lt. Douglas Rolfe, R.A.F. (Hon.)

AVIATION enthusiasts are to blame for fostering the delusion that enormous fleets of bombers can blast entire continents into subjection. This concept just does not fit in with the realities of warfare—at the present time, at least.

Ruined Rotterdam, Warsaw and Belgrade were defenseless cities at the time they were bombed by the Luftwaffe. As against them, we have sturdy London and doughty Stalingrad still standing. Cities, after all, are only minute portions of the earth's surface in comparison to the great open spaces where armies actually are operating today in Africa, Russia and Asia.

Germany will not be defeated until the might of the Wehrmacht, the infantry, artillery, and tanks of her army, are destroyed as tactical units. Japan will not be defeated until the millions of shortlegged "supermen" in her army are blasted and scattered on the ground by superior weight of tanks, artillery and infantry. To search out and bomb the Nazi soldiers in the enormous areas of Europe from Norway to the Black Sea, and to obliterate the Jap soldiers from the air in the vast areas of Asia from Burma to the Siberian border, would take fantastic quantities of explosives and even more astronomical quantities of gasoline, quantities far beyond the capacity of the combined manufacturing and refining facilities of the United Nations. Even if the gasoline could be manufactured, it would have to be shipped by sea; and because of German submarines, the United Nations are short of tankers.

The necessity of shipping gasoline, lubricants, ammunition, bombs, and personnel, plus supplies for the operating and ground crews, illustrates the dependence of air power upon sea power.

But air power can do much more than it has yet been allowed to do in this war. Sea power is properly assessed as balanced fighting units of battleships, aircraft carriers, heavy and light cruisers, destroyers, submarines, hospital, supply, fuel and repair ships, a merchant marine adequate for supply purposes, well distributed bases, drydocks and shore installations. In addition, sea power is equipped with marine landing forces, able to disembark and fight with artillery, tanks, and planes in almost any area.

Sea power, in other words, is a balanced force, able to fight almost anywhere—on the water, in the air and on land, and to maintain and supply itself while so doing.

This, in essence, should be the real concept of air power.

Instead of this, air power is limited to the role of air artillery. Seen in this light, the bomber is simply a flying platform for projecting the range of artillery immense distances, with the fighter plane being a like adjunct, a flying platform for carrying machine gun and light cannon projectiles beyond their normal ground ranges.

Were that same limitation to be applied to land power, we would have armies composed of nothing but artillery and machine guns, lacking infantry to seize and hold ground and cavalry, whether horsed, mechanized or in armored divisions, to break through, encircle and attack flanks and rear.

Wars, in the final analysis, are won on the ground. Men are born, live and find their sustenance on the ground, not in the air or on the water. If air power, as presently conceived, were the preponderant force in war, the Soviet armies would have long since succumbed to the superiority of the Luftwaffe. Instead of that, we saw the successful defense of Moscow—by ground troops—and the successful defense of Stalingrad—again by ground troops, despite repeated blastings by the German bombers. The war will eventually be won or lost on the ground, in Europe, Africa and Asia. Sea power and air power are powerful and effective adjuncts, but they are only auxiliaries to land armies. They exist only to make more potent the heave and

thrust of bayonet, the toss of hand grenade and high angle fire of the trench mortar, between groups of sweating, muddy men, mixing it up on the surface of the earth.

Air power has undoubtedly great value as a bombing force, countered to some extent by improvements of anti-aircraft defense, and by scattering industries out over wide areas as Germany is doing in Europe and as Japan is doing in Manchuria and Korea.

Air power has also an important role in actual battle on the ground, being able to blast enemy fortifications, troop concentrations, artillery emplacements and machine gun nests, as well as to support the advance of its own ground forces by a form of aerial barrage.

But even so, its main capabilities are not realized by most of us.

To understand these, it is necessary to show its relation to the elemental factors of battle. These factors are mobility, fire power and shock. The side having the superiority in these three elements is the side which wins. Air power possesses fire power. It does not possess shock. It possesses mobility—but only as aerial artillery. If it could be made to provide additional ground mobility and shock, its value in ground warfare would be immensely enhanced.

The answer, is of course, a reversion to the sea-power ability to land marines—in other words, air-power ability to land infantry, artillery, tanks, engineer, quartermaster, medical staff, troops and supplies for ground fighting. This means air divisions, balanced with bombers, fighters, troop and supply transport planes and gliders to add additional forces. These would be self contained with all components, as a ground division is self contained, with its own headquarters, staff, medical, engineers, supply, signal and combat troops. As with sea power, it would have chains of bases, supply depots, repair installations and refueling depots.

There is nothing new under the sun. Most new things are combinations of two or more things already existent. Strangely enough, not only the technique and the materiel but also the component parts of well organized and self sufficient air divisions are already at hand, needing only to be combined into integrated and balanced units to give us the necessary air divisions.

Such an air division should be a complete unit, able to move out from its bases, to fly at least 1,000 miles in any direction, and to be self sustaining as to food, ammunition, medical and other supplies for at least five days. For ground combat, it should be able to land a striking force of not less than 3,000 men equipped with weapons permitting both attack and defense against enemy infantry, artillery, tanks and aircraft. Its accompanying air combat force should be capable (a) of defending the air division against hostile attack in the air, and (b) of wrecking enemy installations and attacking enemy personnel on the ground in its role of air artillery.

How would such an air division be used?

Let us take a hypothetical attack fron. England on the shores of France in an effort to seize a naval landing beachhead. One of the best and nearest ports is Cherbourg. It is at the tip of the peninsula of La Manche some 90 miles from England. A peninsula has certain advantages, in that its neck can be blocked off and the flanks of an occupying force protected by water barriers against mechanized assault.

The neck of this peninsula is only 20 miles wide at a point some 30 miles from Cherbourg. The coastal defenses of this port are powerful—but they face out to sea.

The British-American command in England decides, for example, to feint at Boulogne and to strike with two American air divisions at La Manche, followed up by strong sea borne landing forces.

Intensive propaganda, coupled with massing of British forces opposite Boulogne have succeeded in drawing German ground, air and anti-aircraft strength to that area.

Our two air divisions, flying at some five different levels, converge on the peninsula of La Manche from various fields in England, before daylight, on the date set.

The plan of battle has been carefully laid out, with every unit instructed in its role. Like all good plans, it is simple, following closely the tactics of ground warfare. The main enemy force is in the vicinity of Cherbourg itself, some 10,000 men manning powerful coastal defense batteries. The nearest reserve, a motorized division, is at St. Lo, about 40 miles, an hour's time, from Cherbourg. There are three air fields on the peninsula, near Montebourg, near Valognes and near St.

Continued

A PLAN FOR TRUE AIR POWER

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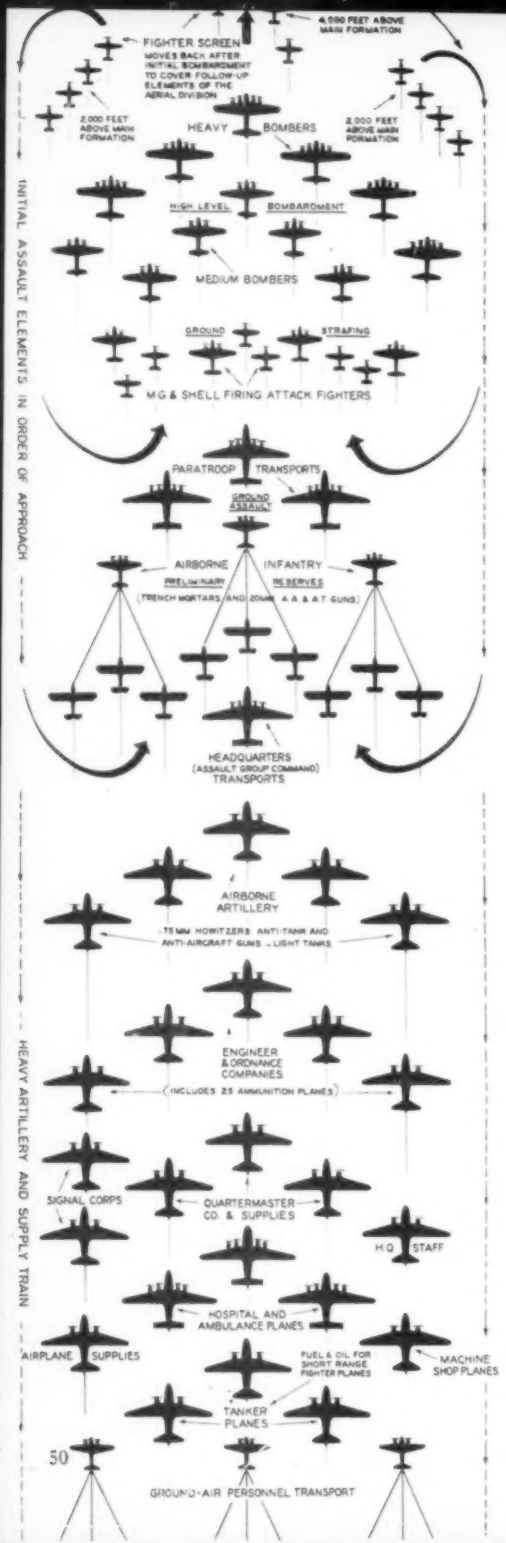
Germain, with an estimated 50-60 fighter planes distributed between them. The beaches on three sides of the peninsula are protected by barbed wire and pill boxes against invasion from the sea and are patrolled day and night by German soldiers.

A frontal attack, by sea against Cherbourg, would be a costly failure just as a frontal

4 Masses of support troops in gliders follow Marines to exploit and hold the beachhead.
DOUGLAS HOLT
5 Huge transport planes next come bringing light tanks, anti-aircraft guns and supplies.
6 Convoys of naval vessels then arrive on schedule, bringing heavy materials and regular equipment.


4,000 FEET ABOVE MAIN FORMATION
FIGHTER SCREEN MOVES BACK AFTER INITIAL BOMBARDMENT TO COVER FOLLOW-UP ELEMENTS OF THE AERIAL DIVISION
2,000 FEET ABOVE MAIN FORMATION
HEAVY BOMBERS
2,000 FEET ABOVE MAIN FORMATION
HIGH LEVEL BOMBARDMENT
MEDIUM BOMBERS
GROUND STRAFING
M.G. & SHELL FIRING ATTACK FIGHTERS
PARATROOP TRANSPORTS
GROUND ASSAULT WAVE
AIRBORNE INFANTRY
PRELIMINARY RESERVES
(TRENCH MORTARS AND 20MM A.A. & A.T. GUNS)
HEADQUARTERS (ASSAULT GROUP COMMAND) TRANSPORTS
INITIAL ASSAULT ELEMENTS IN ORDER OF APPROACH
AIRBORNE ARTILLERY
(75 MM. HOWITZERS ANTI-TANK AND ANTI-AIRCRAFT GUNS. - LIGHT TANKS)
ENGINEER & ORDNANCE COMPANIES
(INCLUDES 25 AMMUNITION PLANES)
SIGNAL CORPS
QUARTERMASTER CO. & SUPPLIES
H.Q. STAFF
HOSPITAL AND AMBULANCE PLANES
AIRPLANE SUPPLIES
FUEL & OIL FOR SHORT RANGE FIGHTER PLANES
MACHINE SHOP PLANES
TANKER PLANES
GROUND-AIR PERSONNEL TRANSPORT
HEAVY ARTILLERY AND SUPPLY TRAIN

attack on land against powerful fortifications would be likely to fail. The answer in land warfare, would be to hold or contain the enemy's front, to prevent reserves reaching him and to strike him in flank and rear, or both.

The first two objectives can be achieved by artillery in many cases, by using a box barrage, with the near curtain of fire containing the enemy's front line while the farther curtain of fire prevents his reserves from coming to reinforce him. The heavy artillery of the two air divisions, the bombing forces, therefore, starts the show. Appearing out of the murky skies of gray dawn, the huge four motored bombers and the deadly medium bombers drop a devastating rain of bombs with almost split second timing, simultaneously on the coastal batteries around Cherbourg and on the quarters of the motorized division at St. Lo. While this barrage smashes coastal gun emplacements and shatters the men and trucks of the surprised motor division, what might be called the cavalry of the air divisions, the fighter planes, carry out their cavalry duties of information, security and flanking attack. Some 300 of them, in units of 100 each, accompanied by medium bombers as supporting artillery, swoop down in three detachments on the three German airfields, smashing the Messerschmitts before ever they have chance to rise. The anti-aircraft batteries protecting the flying fields are put out of action before they have had opportunity to loose more than ten rounds.

Another flight of fighters, on security patrol, runs head on into a flight of Messerschmitts hurrying from Bayeaux and blasts them from the skies, returning from this task to join the main air-cavalry force of some 600 fighters, which is sweeping the beaches, the pill boxes, and the barbwire, with a lethal rain of machine gun and light cannon projectiles, clearing the way for the fleet of naval [*Continued on page* 146]

Diagram at left shows the order in which various waves of planes and gliders would go into attack.

You may worry about the size of your steak

. . . but here is one worry you can avoid

A BIG, juicy, pre-war steak is hard to get these days. So is a new car. That's why it pays to take *extra* care to avoid *extra* wear on your car's king pins, tie rods, steering crank bearings and other vital friction points that mean costly repair bills when neglected! Play safe—with Marfak chassis lubrication every 1,000 miles!

Marfak helps add miles to your car's life. It's super-tough. It "stays put." It resists wear-out, wash-out and squeeze-out.

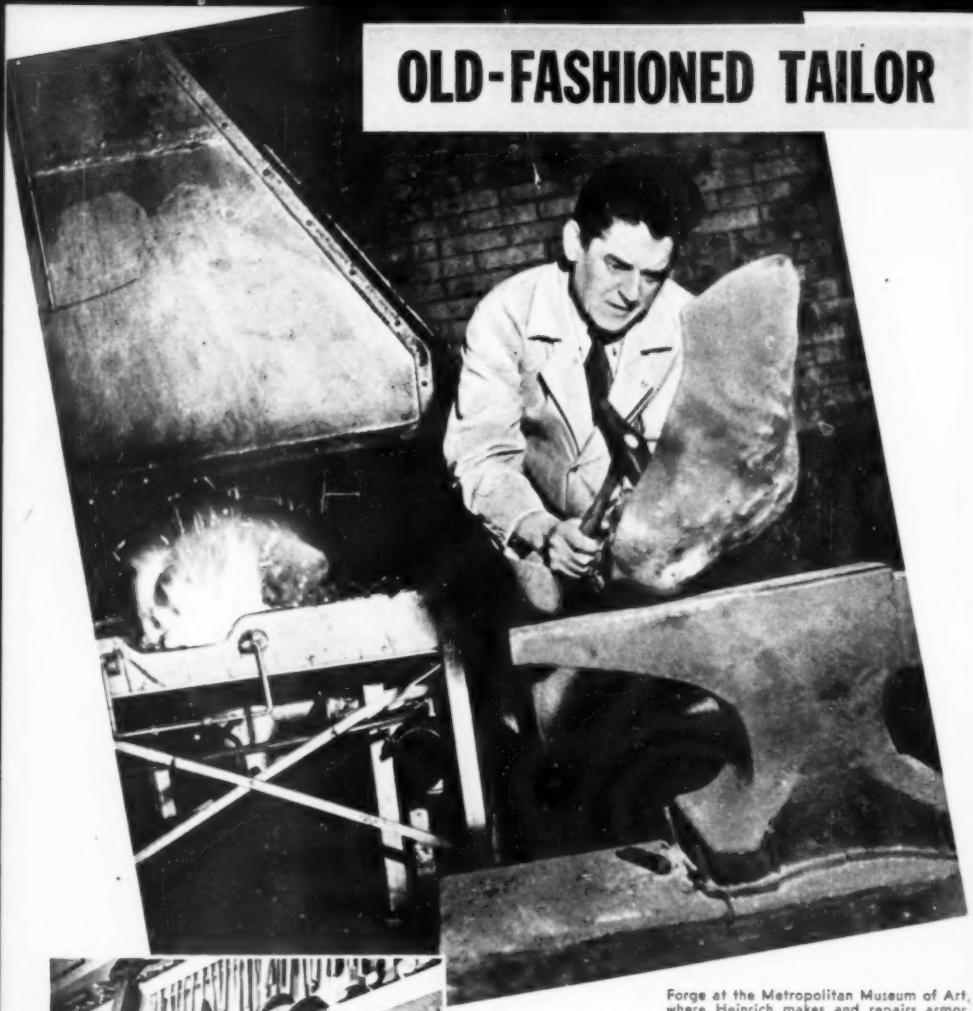
To insure *worry-free* protection, Marfak is accurately applied by chart, never by chance.

For your peace of mind, never say "grease job." Insist on genuine Marfak Chassis Lubrication. At Texaco and other good dealers everywhere

TUNE IN: FRED ALLEN every Sunday night. See your local newspaper for time and station.

You're Welcome at **TEXACO DEALERS**

OLD-FASHIONED TAILOR



Forge at the Metropolitan Museum of Art, where Heinrich makes and repairs armor.

These tools, once the property of medieval craftsmen, are used by Leonard Heinrich for his "tailoring." Work is identical with originals.

BELIEVE it or not, there is a man in New York who is still living in the Middle Ages, in a manner of speaking. He is Leonard Heinrich, head of the armory of the Metropolitan Museum of Art.

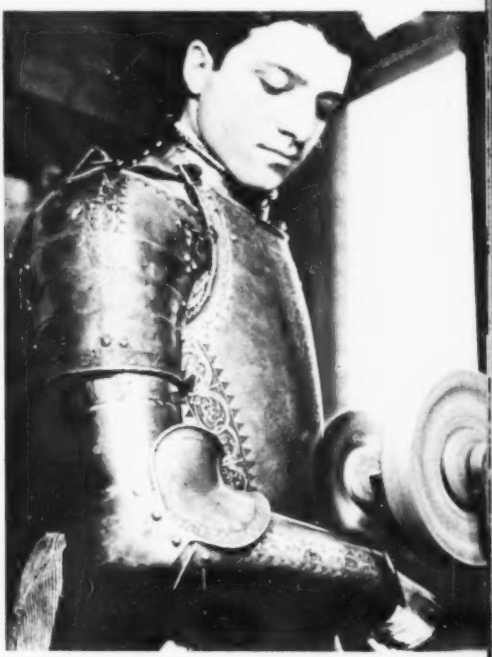
A specialist in the making of armor, Heinrich is one of the few men who knows the art of tailoring as it was practiced in medieval times when knighthood was in flower. His job is one of the most exacting and unusual in the country.

Operating a forge equipped with tools that were used in the sixteenth and seventeenth centuries. Mr. Heinrich's job is to keep the 50,000 pieces which form the museum's world-famous collection of arms and armor in [*Continued on page* 145]

Ancient armorers used these giant shears. Heinrich uses them, too, finds nothing better.

The fitting. Collar comes first, and doesn't look too comfortable. Heinrich finds knights of old were no giants, more often were shrimps.

Close-up of lance rest. Armor had to be flexible to permit freedom of action by the wearer. These pants bend easily.



No dry cleaning for this suit. Buffing wheel or electric polishing machine does the job instead, even on the fanciest outfits.

THE FISH THAT SPITS IN

THE attacker circles high in the air, scanning the ground. Suddenly he wheels sharply into a steep dive; down he plummets, wings braced against the screaming rush of air. Abruptly a black object, like a bomb, breaks loose from beneath him, whistles on down as he pulls out, and smashes into the objective. It is a perfect dive-bombing attack.

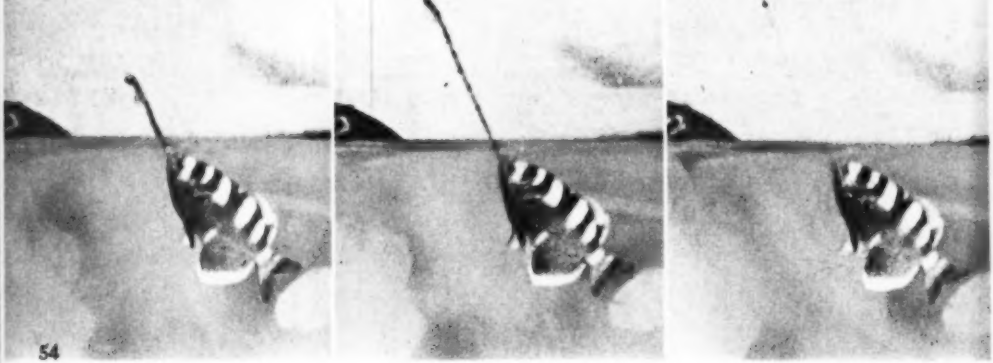
But this attacker is not a plane; it is a bird—the black-breasted buzzard, of Australia, originator more than a thousand years ago of one of human warfare's most modern techniques. Prime items in the diet of this bird are the eggs of the emu, a large ostrich-like bird which, since it cannot fly, nests on the ground. The buzzard frightens away the guardian of the nest by fierce flapping of its wings, then breaks the hard-shelled eggs by dive-bombing them with rocks!

So, in the continuous warfare among birds, insects, reptiles, animals and even fish, practically every weapon of battle among men has its counterpart. Poison gas, anti-aircraft, flame-throwers, armor, smoke-screens—all are duplicated. Air-raid shelters are old stuff to certain reptiles whose misfortune it is to be considered palatable by hawks. Camouflage is not restricted to mere protective coloration or attempts at concealment, but merges into positive mimicry, with certain creatures seeking safety in looking like other creatures.

Artillery, for example, is represented by the ant-lion, an insect which looks somewhat like a mayfly. The larva of the ant-lion burrows little craters in the sandy stretches of clearings and along the edges of forests, and hides in them, completely invisible except for a small part of its head. As soon as an ant passes nearby, the action begins: a rapid-fire bombardment of grains of sand spews from the crater. The ant, knocked off balance, is peppered with sand until it falls down into the crater, and into the larva's ready jaws.

An even more remarkable example of organic artillery, however, is the Siamese archer fish, whose specialty is anti-aircraft fire. The reason for the archer fish's ability and skill in this difficult art is entirely utilitarian; the archer fish eats flying insects, and, being unable itself to fly in pursuit of them, it must take measures to bring them to it. This it does by lying in wait just beneath the surface of the water; as soon as an insect flies close

The fish that spits in your eye is the Siamese archer fish, shown in action in the strip of photographs here. The archer fish can squirt a stream of water nearly two feet into the air with deadly aim, to knock down an insect for dinner.



YOUR EYE

by Willy Ley

by, the archer fish projects its snout upward and, with deadly aim, shoots a stream of water at its quarry. The insect, battered and wet, falls into the water. The archer fish eats. It has been reported that one cannot smoke a cigarette in the evening near a pool inhabited by archer fish; mistaking the burning tip for a firefly, the fish will put it out in no time with well-directed squirts. It is just too bad if you happen to have the cigarette in your mouth at the moment.

Less spectacular, but equally remarkable, are a widely distributed tribe of European land snails. They grow a tiny chalky arrow, about a quarter of an inch long, but that arrow (there is only one per individual) is not used against enemies, it is used during the mating process. Nobody can tell or even guess precisely what part that arrow plays. Observers have seen thousands upon thousands of times that the arrow was "shot" or thrown against the mate by a sudden tensing of the muscles. The reaction showed clearly that the impact was painful, and in certain cases death occurred after a few hours.

Also, in the same regions where those snails abound, lives a small insect, about a third of an inch long, called the bombardier beetle. This beetle often succeeds in frightening small enemies and even people, unless they know what it is, for, when such a beetle feels itself cornered, its answer is a real shot—a sudden puffing sound and a small cloud, with only a muzzle flash lacking. Its "projectile" is a mixture of acids.

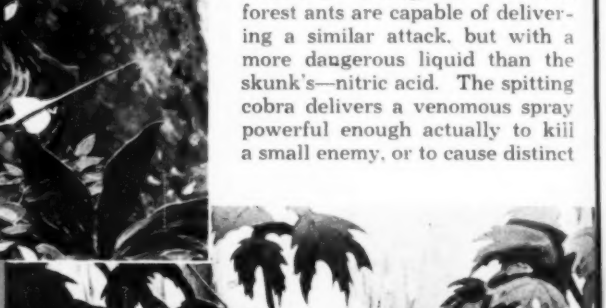
The expectorating fish has one of many strange weapons in Nature's continuous warfare for food and existence.

Dive bomber attack and air-raid shelters are old stuff to the animal world.

The first smoke screen was created, not by man, but by the octopus *(above)*.

Today's troop gliders have their counterpart in the flying squirrel and the flying lizard shown in the drawing above.

This Museum of Natural History drawing *(right)* depicts the turtle—the animal world's million-year-old version of a tank.



Only among the unlearned, of course, is the porcupine considered a unit of artillery, for the porcupine does not actually shoot its quills at all. It is, in fact, a special sort of armored unit, not truly comparable to anything found in man's battle weapons. Most of man's armored units, however, are duplicated by other creatures. The tortoise is nature's organic pillbox. The rhinoceros is a living tank—and a very effective one, with not only heavy armor and high speed, but a deadly and powerful weapon in the horn on its snout. Alligators and crocodiles, in a sense, go beyond any of man's weapons; they are not only armored, but are amphibious, and combine in addition excellent camouflage with devastating offensive power.

In chemical warfare, too, man's best is surpassed by several other creatures. That usually well-mannered animal, the skunk, for example, can deliver when attacked a noxious charge which, though not deadly, remains unmatched by any human poison gas technique for accuracy, concentration and lasting effect. Certain forest ants are capable of delivering a similar attack, but with a more dangerous liquid than the skunk's—nitric acid. The spitting cobra delivers a venomous spray powerful enough actually to kill a small enemy, or to cause distinct discomfort even if directed at a man. But unique in this field, for originality if not for lethal effect, is the Texas horned toad. Strictly speaking this is not a toad at all, but a lizard; its secret weapon, when annoyed or attacked by a formidable foe, is to squirt a stream of blood from its eyes. No ordnance department in the world has anything to compare with that.

Unsuccessful innovations in the animal world are as disastrous as in human warfare. The normal weapons of offense of animals are, of course, tooth and claw, the power and swiftness of strike and bite. Several

Continued

THE FISH THAT SPITS IN YOUR EYE

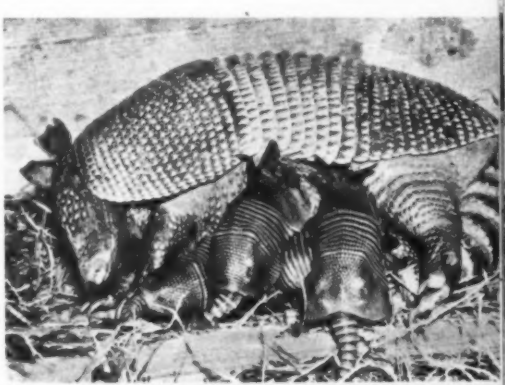
million years in the past some large carnivores thought that they might do well to develop long daggers, to practice stabbing instead of biting. They were the so-called saber tooth tigers—it would be more correct to call them dagger tooth cats since the long teeth were used as daggers and not as sabers and since the animals were cat-like, but not tigers—with foot-long tooth weapons. There exists a famous fossil skull of a large cat of the period, pierced by the dagger of one of those dagger teeth. But as the wound shows definite signs of healing, the stab could not have been fatal at once, though it may well have been in other instances. But all the dagger tooth carnivores—they existed in North as well as in South America and also in Europe at that time—are now extinct; perhaps the daggers were not as efficient as they look.

Poison is a weapon unknown to mammals and birds. The snakes are proverbial for its successful use, but even among the snakes the venomous ones are definitely in the minority; the poisonous varieties are outnumbered by the non-poisonous varieties about three to one. Aside from those snakes only one reptile that is not a snake has poisonous fangs, the Gila Monster of the Southwestern states. But there are quite a number of ocean fish, such as the sting ray, that have poisonous spikes. And there are, of course, many poisonous insects, particularly scorpions and spiders, among which poisonous "fangs" are almost the rule.

Three fishes, however, have succeeded in finding a unique weapon: electric shocks. Biggest of them, and most powerful one as far as electric capacity goes, is the electric eel of South America. Under certain conditions this eel's charge is even able to kill.

In camouflage, not all creatures confine themselves to simple protective coloration, or even to the principle of concealment, basic in most human attempts at this art. Probably the most effectively camouflaged reptile extant, for example, is colored a vivid red, yellow and black—as eye-catching a combination as could be imagined. For this harmless snake's color scheme is almost exactly the same as that of the extremely poisonous coral snake; other creatures, seeing the distinctive hues, mistake the innocuous mimic for the deadly original, and steer well wide of it.

As a matter of fact one has to know a specific rule to tell the two apart at a glance. The venomous variety has a black head with yellow bands, while the harmless imitator has a red head. But if the head should be invisible (and that is, after all, not difficult for a snake to accomplish), it is very hard to tell them apart, [*Continued on page* 157]



The mother armadillo and her litter above are so peaceful because they are well protected by powerful armor-plate.

This Brazilian porcupine was the originator of the modern "hedgehog defense" used by the Russians against the Nazis.

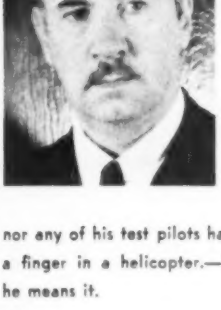
And guess what modern weapon of warfare was invented by the little striped kitty *below*? Poison gas, of course!

YOU CAN FLY MY HELICOPTER

as told to George Daniels

by Igor Sikorsky

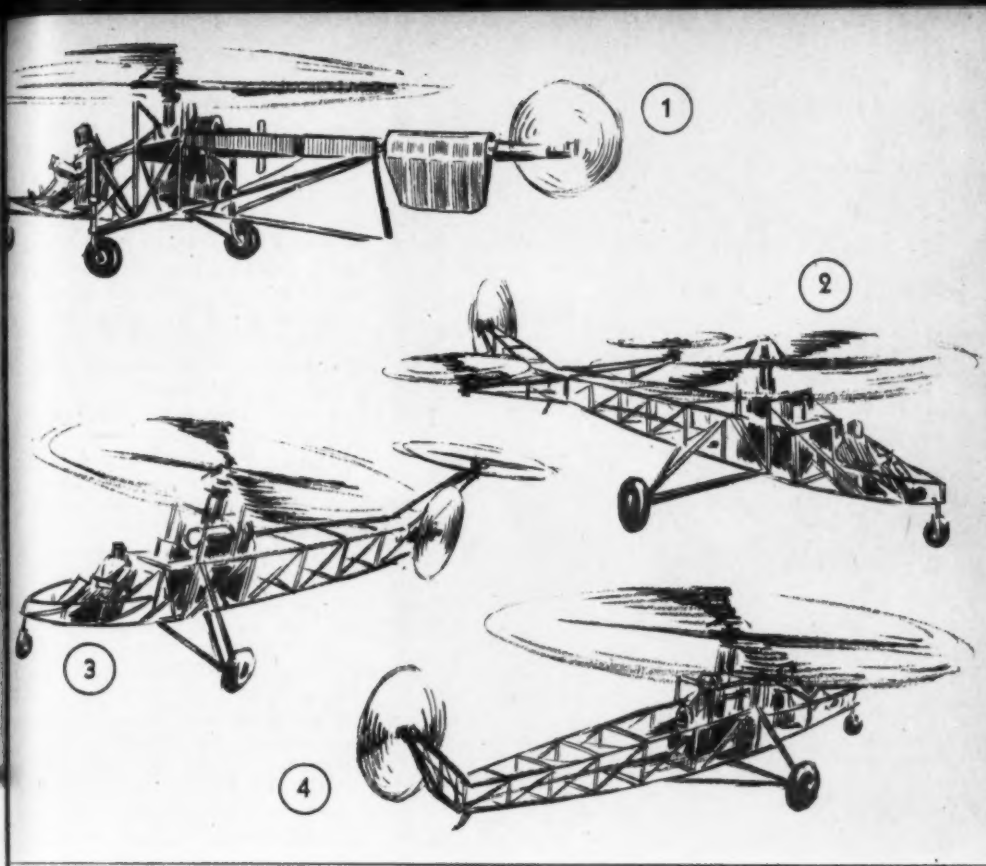
Latest thing released in helicopters is this Sikorsky-built Army ship. Main rotor is approximately 36 feet in diameter, steering rotor at tail, about 7½. Like its smaller sister ship, it can fly in any direction, including straight up and straight down. Army may use this type of ship for message carrying and ambulance work. Rough-sea rescues might be made by rope ladder as shown while ship hovers.



Licensed helicopter pilot No. 1, designer Sikorsky enjoys the thrill and the experience of personally flying his amazing wingless aircraft. He has flown these ships in scores of experimental hops, and also set the world's sustained flight record for helicopters, yet neither he nor any of his test pilots has ever so much as scratched a finger in a helicopter.—When he says they're safe, he means it.

YOUR family helicopter is no longer an idle dream, for what may well be the direct forerunner of the "heli-flivver" is already flying. The present ship is a 100 horsepower ship, with optional installation of conventional wheel-type undercarriage, or pneumatic rubber pontoons that enable it to take off or alight on either land or water, or even on mud, snow or ice.

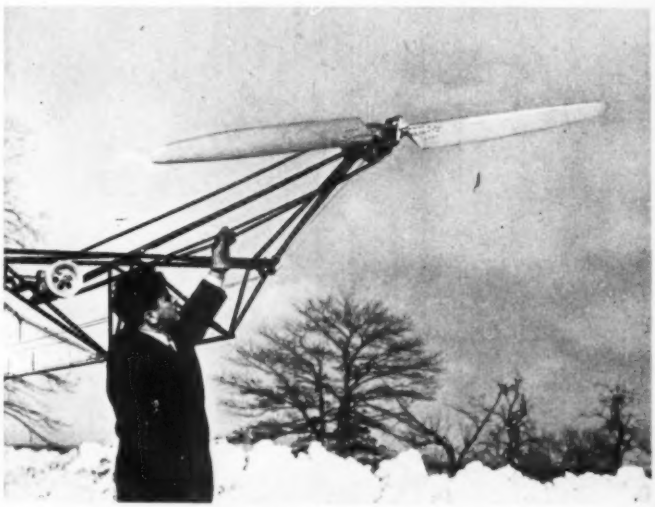
As a result of recent improvements, it is doing the things today that the private owner or commercial pilot of tomorrow will want his ship to do, and it is doing them safely and economically. A mere touch of a lever whisks you straight up



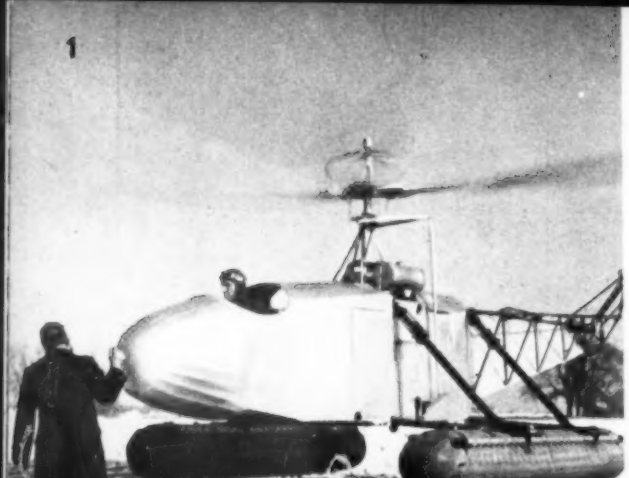
Ship No. 1 was first successful Sikorsky helicopter. Controls were on same principle as those now used. Pilots and engineers lacked experience, so tried types 2 and 3 before returning to original idea (4). Modern fuselage eliminates tail fin.

into the sky in this ship, a slight movement of a control sends you scurrying across the countryside. And all the while you know that the patchwork view below contains a thousand airports—for you can land safely almost anywhere.

This ability of the helicopter to land where other types of aircraft cannot, makes it useful for a wide variety of purposes. The new Army helicopter, for example, has not only hovered stationary in mid-air, but has also shown that a man can safely de-



Patent Engineer V. Roxor Short points to rudder propeller. This steers helicopter by pulling tail to right or left when corresponding rudder pedal is pushed to vary pitch.



The takeoff. Engineer rests hand on helicopter's nose as ship rises slowly, to demonstrate perfect control. Wind is about 20 m.p.h.

scend from it on a rope ladder.

In its original form the experimental ship carried three 46-inch radius propellers at the tail for control. One propeller faced sideways as at present, for steering, and the other two faced upwards at the ends of outriggers on each side. All three had variable pitch blades, controllable by the control stick in the cockpit. When the stick was pushed forward, the two propellers which faced upwards were readjusted to pull upwards, lifting the tail, and depressing the nose. This caused the ship to move forward. The reverse movement of the control stick caused an opposite effect, and produced a backward motion of the ship.

Pushing the stick to either side caused the tail propeller on that side to pull downward while its mate on the opposite side pulled upward, causing the ship to tilt in the direction the control stick was moved.

During the summer of 1941, the main lifting rotor was changed so that the pitch of the individual blades could be varied as they passed each side of the ship. Thus it was possible to cause the main lifting rotor to tilt sideways, controlling the craft in roll and eliminating the need for the two horizontal outriggers at the tail. In their place, one horizontal tail propeller was mounted directly above the tail of the fuselage, facing upwards, and the steering propeller facing sideways at the tail remained as before. The tail propeller which faced upward, lifted or depressed the tail as the stick was moved forward or backward respectively. The side pro-

Hovering over its parking space after takeoff, ship prepares to back away from MI camera.

Continued

YOU CAN FLY MY HELICOPTER

peller continued to act as a rudder, pulling the tail to the left or right when the corresponding rudder pedal was pressed.

The next step in the refinement of the helicopter consisted of redesigning the main rotor pitch control so that the pitch of each individual blade could be varied throughout its entire circuit. Thus, if the pilot wished to point the nose of the ship down, he would move the stick forward as usual, but the controlling effect came from the main rotor. By feathering the blades in their cycle, each blade could, for example be made to decrease pitch as it passed the front of the ship, and to increase pitch as it passed over the tail. This would tilt the rotor forward and cause the ship to tilt forward and, if continued for a short time, to actually move forward.

This system of cyclical pitch control has been found excellently satisfactory, and is the type now used on the test ship. Only one rotor in addition to the main one is needed with this arrangement, and that one faces sideways at the tail to act as a rudder.

Less complex than your automobile, the private helicopter will lend itself easily to production when the time comes, special purpose ships doubtless being among the first civilian machines to serve the public. It is not difficult to see how the helicopter-ambulance, for example, could perform invaluable work in otherwise hopeless instances. It could land and take off without danger in the soft mud of flooded areas, or in the deep snow of an isolated forest clearing. Even the roof of a mountain cabin is an airport for a helicopter.

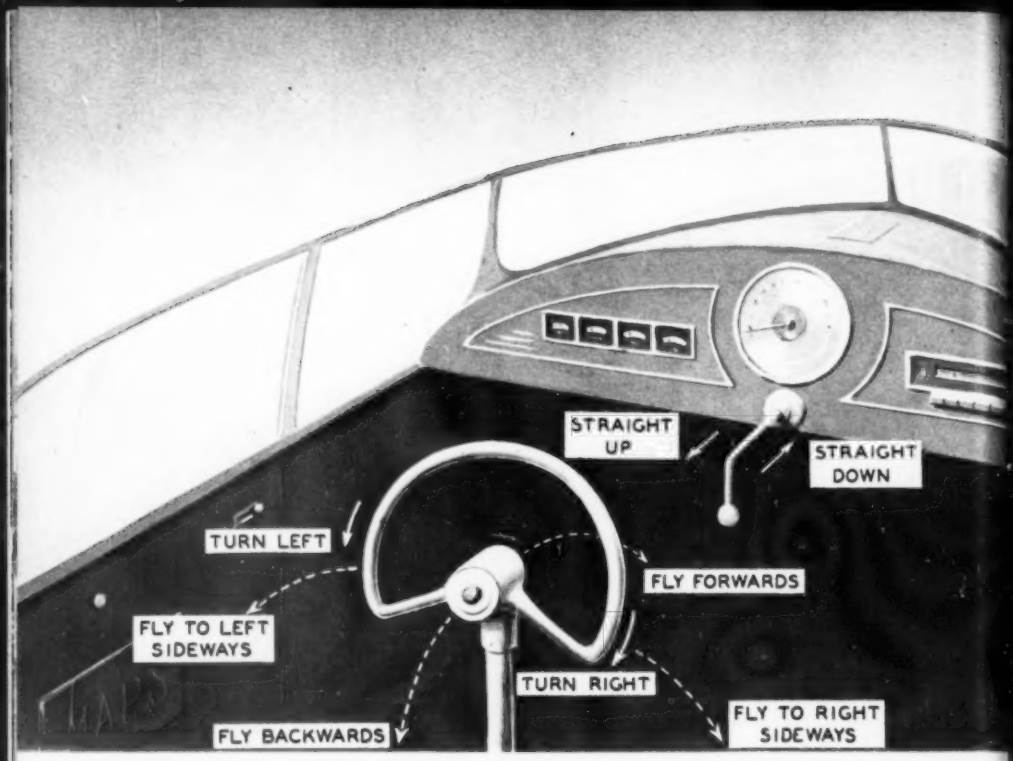
In air mail use, the helicopter could speed the step between mail plane and post office by carrying the mail directly from the airport to post offices in central areas of towns and cities. Landings would

3

Ship backs out of parking area at walking pace, under perfect control—despite rising wind which blew camera tripod over a moment later.

4

Climbing straight up a little higher, as pilot smiles down at camera. Helicopter is no noiser than sport plane. Rotor makes swishing sound.



Artist's version of future helicopter cabin. This control system would eliminate rudder pedals used on today's ship. Airplane pilots prefer rudder pedals, auto drivers may like their airflivvers with wheel and perhaps a throttle they can "step on."

not be essential, along these aerial mail routes, as today's experimental helicopter has already demonstrated its ability to pick up or deliver articles while hovering in mid-air. However, it is difficult to conceive of a post-office, on or near which a helicopter could not be landed.

The controls of the helicopter are simple and easy to master, being practically the same as those of an ordinary sport plane. Perhaps the chief difference lies in a lever beside the seat called the "main pitch control lever." You pull it back—and the ship rises straight up. By using the other controls simultaneously, you can rise at any desired angle.

Perhaps one of the effects of the general use of private helicopters will be that of developing residential areas far from business centers. The healthful atmosphere of a lofty mountain retreat can easily be the home environment of the commuting business man. A hundred mile trip to work is only an hour's ride in a helicopter, and you needn't wonder how you'll get to the office if the weather happens to be foggy. Your helicopter can take off or land vertically as slowly as one mile an hour, or less if need be. It can travel forwards or backwards at an equally low rate of speed, or even sideways when the occasion demands. Once in the air, a few simple navigation instruments will suffice to take you to your destination regardless of visibility, for it is always possible to descend at a snail's pace to check your location by road signs if you're in doubt.

If for any reason, it should become necessary to land in a strange area, you have the assurance that your ship can come in even with a dead engine, at practically walking speed. It is not by any means limited to vertical ascent or descent, however, for the helicopter can glide in any direction with or without power. If your engine should fail, it is a simple [*Continued on page* 131]

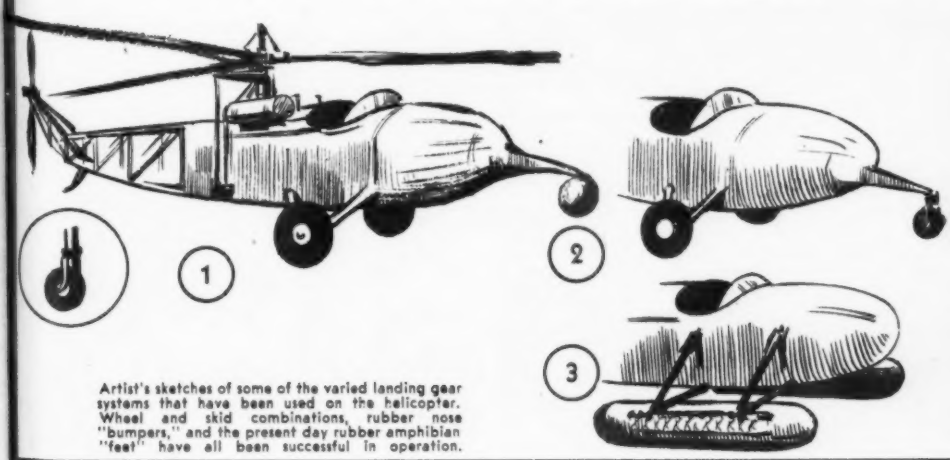
Continued

YOU CAN FLY MY HELICOPTER

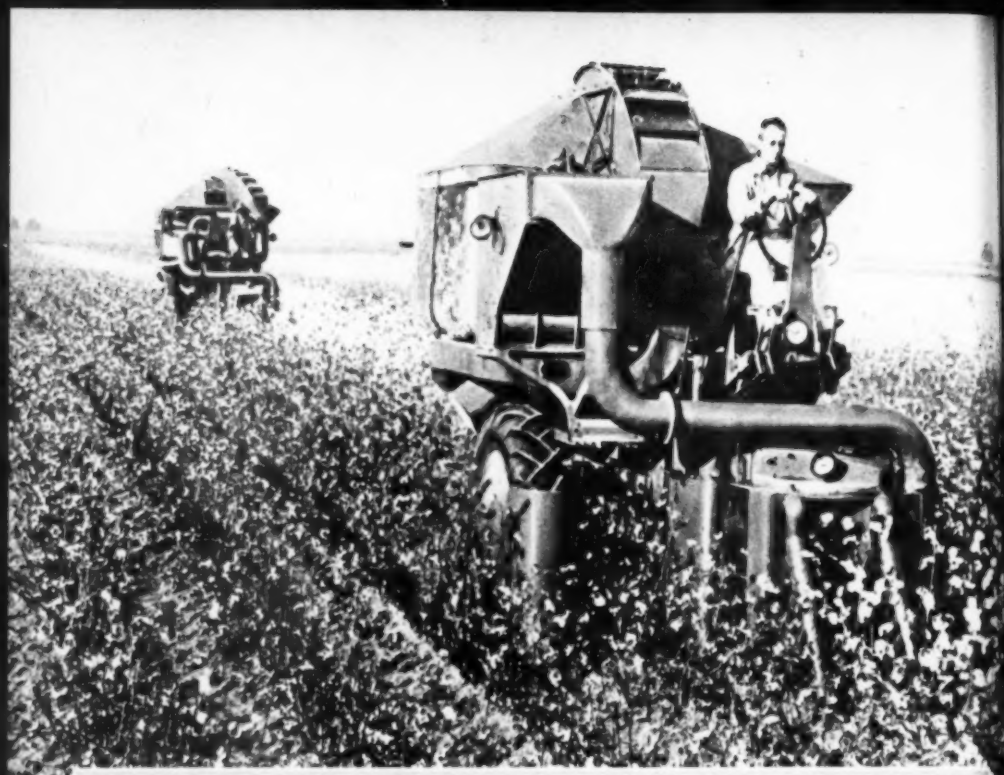
May

While the pilot beside him leisurely holds the ship stationary in midair, passenger of Army-Sikorsky helicopter opens door and receives package from girl on ground.

Chief Pilot Charles L. Morris prepares for a hop in the daddy of heli-flivvers. He holds helicopter license No. 2 Rotor control rod is visible on fuselage side behind cockpit.



Artist's sketches of some of the varied landing gear systems that have been used on the helicopter. Wheel and skid combinations, rubber nose "bumpers," and the present day rubber amphibian "feet" have all been successful in operation.



THE FARM OF TOMORROW

by Donald G. Cooley

Selective breeding of livestock, electronic bombardment of seed and new techniques will combine in the post-war world to revolutionize both farm operation and farm living.

THEY were three ordinary-looking hen's eggs, but the laboratory man had a sly glint in his eye as he handed them to his visitor.

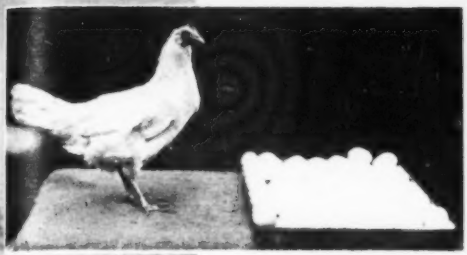
"Go ahead," he invited. "Break them."

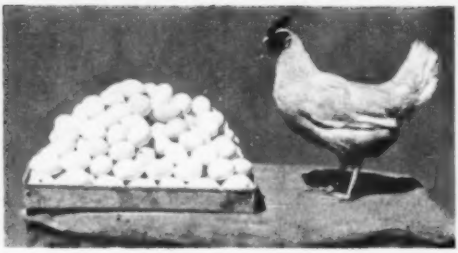
Eighth in the MI Series
"A WORLD YOU NEVER KNEW"

The visitor cracked one white shell and watched the contents slide into a dish. He had the bemused look of a man who has just seen a magician pull an elephant out of his sleeve. In the middle of the little pool of egg-white there floated a yolk as blue as a 5-cent stamp.

The second egg yielded a yolk the color of a ripe cherry. The third was grass green.

"I'll bite," said the visitor. "How did you get those dyes through the shell—with a hypodermic needle?"





Above: Selective breeding pays off. At *left* is an ordinary stock hen and her annual production of 90 eggs. At *right:* a hen bred for increased laying; annual production 240 eggs.

The mechanical cotton picker, above, has been tested and proved; quantity production awaits the end of the war.

"The hens put them there," said the scientist. "In studying poultry metabolism, we add minute quantities of certain minerals—strontium and such—to the feed, and the chicken does the rest."

As yet we have no market for eggs with yolks to match one's necktie, though there's an idea there. But this true story will serve as well as another to lift the curtain on the things chemists and physicists and researchers in basic science are doing to make tomorrow's farm something we have never known before.

Chemists are showing the farmer how to get wool suits out of a milk can, rubber tires from oats, plastic automobile bodies from straw and beans. They are giving him compounds that make potatoes grow twice as fast, and glue ripe apples to the trees until he is ready to harvest them. Biologists are showing how a prize bull grazing in an Ohio pasture can father a thousand offspring a year in Canada, South America or England.

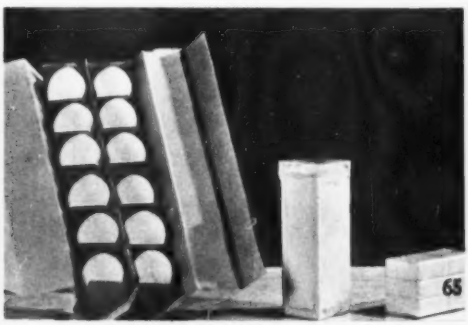
Radio engineers have developed powerful X-ray machines that bombard seeds and plants with streams of electrons, to produce strange new plant forms. Botanists are perfecting strains of corn that will resist cold, tomatoes and watermelons without seeds, plants twice or four times the size of their parents. Glider trains and giant cargo planes developed for war needs foreshadow the day when every farm will be as close to London or Buenos Aires as the nearest airport.

Yes, tomorrow's farm is going to be different!

It's any man's guess what the farm of the future will look like. The new forces loosed by science are too varied and potent for cocksure prediction. But dim outlines of the picture are beginning to emerge.

It is likely that each community will have

Left, eggs are dried in a huge blower at an Armour and Co. plant. *Below,* a dozen eggs; *at left,* in natural state; *center,* dried to a powder; *right,* dried and compressed—easy to ship, able to keep indefinitely, preserving all natural nutriment.



Note the difference between scrub cow, *left*, a poor beef animal and evidently a poor milker, and the carefully bred beef cow at *right*. Studies in breeding are far advanced at government experimental farms.

a dehydration plant for reducing fresh harvests to dried foods of one-tenth the normal bulk. These concentrated, spoilproof forms are necessary for the transport of compact nourishment to starving lands. The farmer's market widens to include all the world, and crop surpluses and depressed prices will be unknown. Even if the world were abundantly fed, there will be vast markets for farm products for other uses than food.

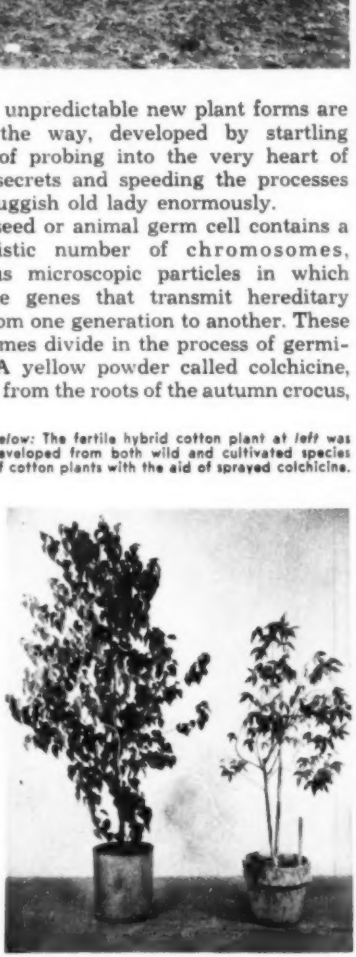
Each farm may have its own quick-freezing unit, moved from field to field under its own power to transform freshly harvested crops into frozen blocks of food. They can be stored indefinitely or be sent off by plane to the morning's markets in Chicago or New York.

Oil wells may be grown instead of drilled. The castor bean, the soy bean and the peanut are rich sources of oils for cooking, lubricants, paints, and a hundred chemical uses. Demand for alcohol, raw material for countless new products, will bring distilleries within easy range of the farm. One compound, butadiene, used in making synthetic rubber is derived from alcohol, which is also a potential fuel for driving trucks and tractors.

Some new farm crops are already here: soy beans, Russian dandelion and other rubber-bearing plants, pyrethrum for insecticides, drug plants for medicinal use. But unpredictable new plant forms are also on the way, developed by startling methods of probing into the very heart of nature's secrets and speeding the processes of that sluggish old lady enormously.

Every seed or animal germ cell contains a characteristic number of chromosomes, mysterious microscopic particles in which reside the genes that transmit hereditary factors from one generation to another. These chromosomes divide in the process of germination. A yellow powder called colchicine, extracted from the roots of the autumn crocus,

Below: The fertile hybrid cotton plant at *left* was developed from both wild and cultivated species of cotton plants with the aid of sprayed colchicine.



Continued

THE FARM OF TOMORROW

has the fantastic power of preventing this cell division. The result is a doubling of the number of chromosomes, and consequent gigantic plant forms. [Editor's Note: Colchicine is no longer available commercially for amateur experimenters, due to the war.]

You get such remarkable species as cotton with bolls five inches across, soy beans with quadrupled oil yield, calendulas double the diameter of their parents—all these achieved already, and no one knows what other extraordinary varieties are on the way.

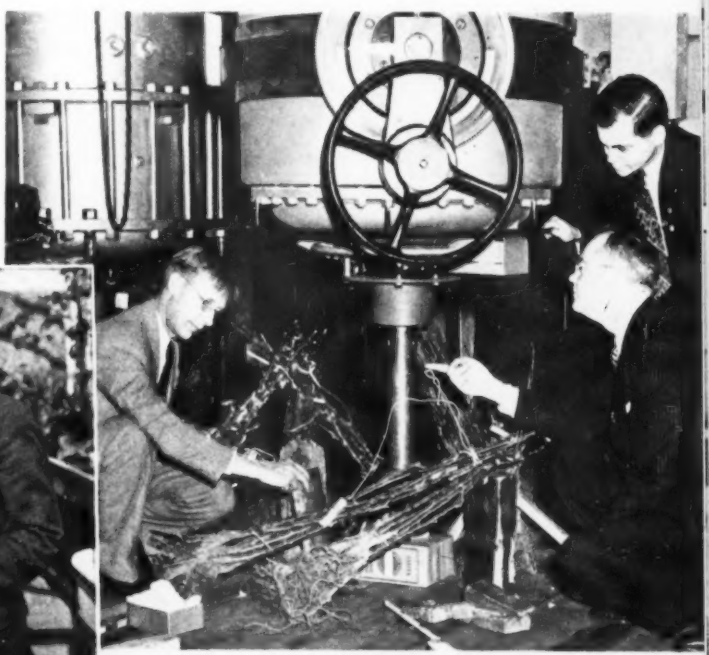
A group of chemicals known as plant hormones or growth regulators have produced seedless squash and watermelon and eggplant, and tomatoes with fewer seeds and firmer flesh. Indolebutyric acid is one of these regulators; sprayed on apple trees, it keeps the fruit clinging to the branches, right up until midwinter if spraying is repeated every two weeks. Other regulators have doubled the yield of corn and beans under certain soil conditions.

Potatoes grow twice as fast and the yield is greater when they are treated with propylene, a byproduct from the cracking of petroleum. Australians are forcing pineapples into early bloom by dropping calcium carbide particles into the young plants. Moisture generates acetylene gas which acts like a shot in the arm to speed growth. Tomorrow's farm may produce twice as many crops per season and some items may be forced for early markets so the average farmer can compete with the greenhouse grower.

Those same chromosomes we have mentioned are disturbed in an even more devastating way by bombarding them with electrons or X-rays. The mechanisms of heredity are profoundly disturbed, resulting in strange and weird plant types. General Electric scientists recently bombarded seeds and seedlings with million-volt X-rays and planted them to await results. A few improved flower specimens have resulted from such treatments and new food plants may conceivably result.

Much farther in the future, but a reasonable possibility if your imagination will string along, is the time when the farm may be used as a capturer of solar energy. In truth, that is what it has been since the dawn of agriculture, for the plant leaf is essentially an organic factory powered by sunlight. Coal and oil are stored forms of solar energy derived directly or indirectly from plants.

We have recently arrived at a much better understanding of how the plant leaf works. "Photosynthesis" is the scientist's word for the process by [*Continued on page* 148]



Left: Mutations are produced by X-rayed seeds; left hand, twisted-stem grapefruit; right hand, grapefruit that flowered in six weeks.

Above: In General Electric's laboratories, plants of various kinds are subjected to 1,000,000-volt X-rays, effects carefully studied.

SPECIALISTS IN SNOW

Snow specialists in the heights of the Rockies sink a snow "test tube" into a 20-foot drift to read the story of next year's crops and feed for cattle.

by Elon Jessup

The story of a hobby that developed into a new science which saves millions of dollars a year.

IN A recent summer, the streams that bring life to the soil of large areas of California, Utah and Idaho dried up early. By midsummer their beds were powder-dry, around them the land parched in the sun; over everything lay the hot, deadly hand of drought.

No cattle could live on such land; but no cattle were there—they had all been moved, a couple of months before, to ranges whose water supply was assured. No crops could grow in that dry heat, but the farmers of the region were unworried—they had all planted crops which matured early, and had got all their harvests in and to market by the time the drought came. The wrong kind of crops planted in the first days of that spring could have cost the farmers $3,500,000; by planting the right kind they not only didn't lose money, they had a pretty good year.

Luck? Not at all. The farmers and cattlemen of those states hadn't been guessing when they did their planting and moved their stock; they'd known exactly what was coming, known even when it was coming almost to the day. How? The snow survey man had told them.

In another recent spring, towns bordering the Peace River in Colorado were growing uneasy, for snowfall during the preceding winter had been unusually heavy, and there was serious danger of spring floods. Could their dam take it? A lot of the townsfolk thought not. A general demand was registered to have the gates opened. Could you expect any one to object?

But there were objections. They rolled in galore, from irrigation farmers living down the valley. Water, three months later, to those farmers would mean flowing gold. They couldn't bear the thought of it running to waste. They too, but in a different way, were thinking of self-preservation.

The only person possessing actual figures and facts on the problem was the snow survey man. The opposing parties called him in. Subsequently, on his recommendation, the gates were temporarily opened to release

A delicate scale weighs the "test tube" of snow to reveal the secret of the life-giving moisture it contains.

a specified amount of water. Then the gates were closed again to build up a reservoir for summer irrigation requirements. The forecast turned out so accurate that the reservoir was completely filled almost to the day the snow run-off season ended. Everybody was satisfied.

So highly developed is the snow survey now that the run-off of an entire vast watershed can often be forecast with an error of less than five per cent. But it has taken thirty years of unflagging effort to achieve this precision. It was in 1909 that the remarkable man chiefly responsible for the modern snow survey, Dr. James Edward Church, stated in an obscure but historic report to the Nevada Agricultural Experiment Station:

"By carefully determining the snow content of the various districts of the watersheds . . . knowledge of the run-off can be acquired. . . . In this way the cause of agriculture under irrigation can be materially advanced."

Dr. James Church, the archaeologist whose hobby created snow science.

James Edward Church, transplanted from Michigan to the mountainous West, via studies in archaeology in Italy and Greece, seemed about as far from being a scientist as any man imaginable. Nor was he an agriculturist in any sense. By training and profession he was, in fact, a teacher of Latin.

But this specialist in the classics developed a passion for climbing mountains during his days off, and, oddly enough, especially in winter. No "sensible" man in those days, long before the skiing boom, would have anything to do with a mountain in winter if he could help it. Church loved it. The fifteen hours' ascent of Mount Rose was one of his favorite jaunts. When snows were at their deepest he climbed to the top of Mount Whitney, highest winter ascent possible in the United States. Snow was his hobby.

The teacher of Latin decided to become a scientist, to make an intensive study of winter

A shelter cabin build for the snow scientists nigh in the peaks of the western Rockies.

weather and snow. He offered to take maximum and minimum temperatures on the summit of Mount Rose every month for a year if somebody would furnish the instruments. Somebody did, and Dr. Church packed an instrument shelter up to the summit and set it up at an altitude of 10,800 feet. That was the beginning of the Mount Rose Observatory, since become famous, Dr. James E. Church founder.

He'd heard of investigations made about 1900 by Charles W. Mixer in Maine in estimating snow cover as related to the storage lakes of the Androscoggin Basin. And he was intimately familiar with the ever-unanswered query of the agricultural West: How much snow is there in the mountains? The years 1906 to 1916 he devoted intensively to finding out.

The attitude of his friends alternated between amusement over his folly and worry over his safety. But he presented a sound enough case to have his investigations in the field and development of instruments liberally supported by the Nevada Agricultural Experiment Station until 1916. Then from 1916 to 1930, his equipment was donated by the State of California. Following a severe drought in 1930, Nevada decided it needed him back.

Thus the teacher of Latin who had made a hobby of snow became the founder of the now science of snow surveying, and one of the most highly respected meteorologists in the country. So widespread have recent developments been that every winter and spring finds Federal, State and private agencies employing more than 2,000 snow surveyors to gather water supply forecasting data in the snows of the Adirondacks, White Mountains, Rockies, Sierras, Cascades and lesser ranges.

The irrigation farmer knows at last just what to expect, and he can plan accordingly. If the snow surveyor tells him he will have an ample supply of late water, he proceeds to plant late-maturing crops; he plants early-maturing crops if he knows the water will be short. Happily, irrigation farming is flexible enough to be adapted to expected water supplies.

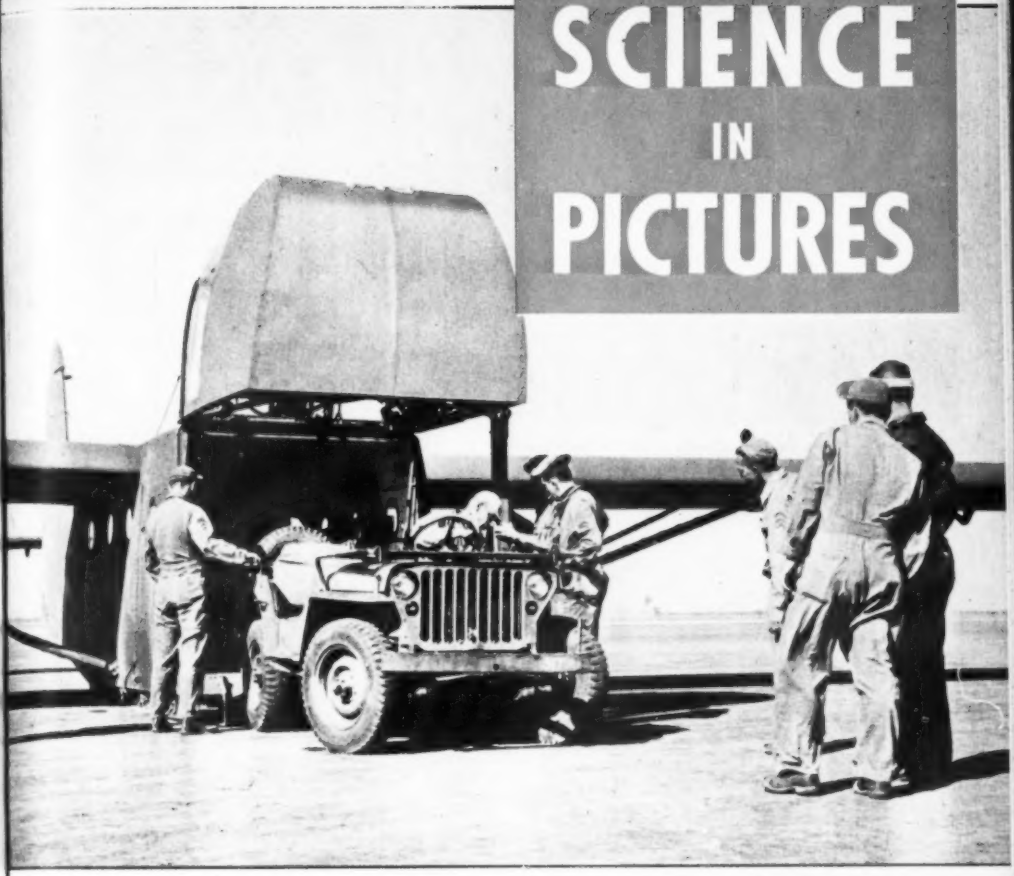
Then, there are the vitally important operations of hydroelectric plants. Take the giant Boulder Dam as an outstanding example. It must generate as much power as possible. But it must also withold water for irrigation. How much water will snow in the mountains yield? The Forest Service would like to know that too. Fire fighting plans can be adjusted accordingly. Even the small town banker is involved, less uncertain now than he used to be in placing agricultural loans.

During winter itself the old burden of removing snow from the highways is eased. Two winters ago the State of California wished to know what it would be up against in opening an eleven mile stretch of highway over the crest of the Sierras. By using snow survey methods it was determined 163,000 cubic yards of snow weighing about 34,000 tons would have to be moved. This meant 417 pounds per cubic yard. Engineers could figure out beforehand almost to the dollar what it would cost.

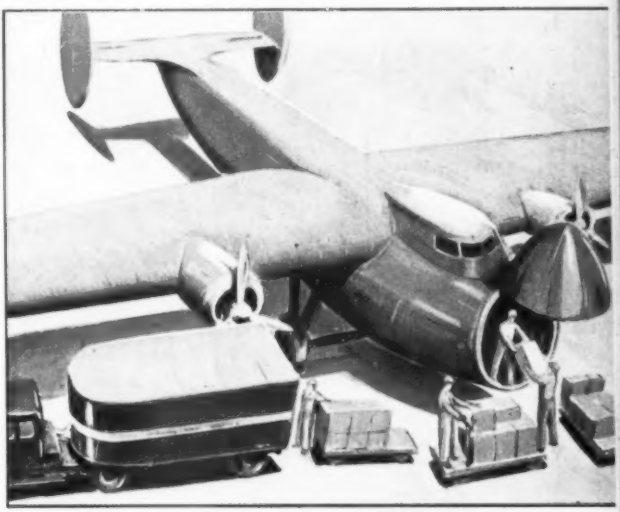
As you read this, there are probably hundreds of snow survey crews beating their arms to keep warm, taking data on snowfields throughout the mountain west. It is arduous work, in some cases hazardous work, especially at this time of year when the danger of avalanches in the high mountains is so great.

Considering the appalling vastness of the job, one wonders how the ground can begin to be covered. Take the great Humboldt Basin in Nevada. This [*Continued on page* 154]

SCIENCE IN PICTURES



TROOP-CARRYING gliders have already made their mark in this war. Now, to supplement them, comes the jeep-carrying glider, *above*, being loaded by student pilots at an Army glider training school. Backed in through wide nose-opening, the jeep rides easily in the glider's fuselage, is ready to dash out and go into action on the instant of landing. Note the similarity between this Army sailplane and the design for the "Aerial Freight Car" by Harlan D. Fowler, of the Fowler Aircraft Co., from the January, 1943, MECHANIX ILLUSTRATED, at *right*. Notable difference: at right, the pilot's cockpit and controls are fixed; in the Army's glider the pilot's seat is in the nose, swings up.



Pilots Have A Name For It

THE picture at left, taken in England, is one of the most remarkable ever made of the vapor that often trails speeding airplanes at high altitudes. It is caused by water vapor from engine exhausts striking cold air with a high relative humidity, and condensing into fog. Similar trails are sometimes formed by the wingtips of fast planes in cold, saturated air. Pilots call it "Gremlin Smoke."

The U. S. Navy Tests Its Fastest Boat

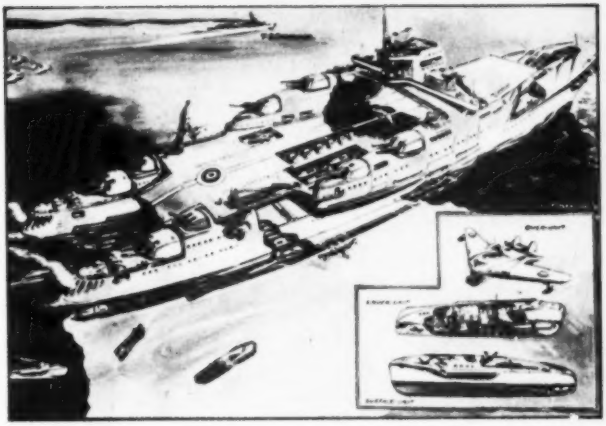
PICTURED at right during a recent test flight is Consolidated Aircraft's new Model 31 patrol type plane, hailed by the U. S. Navy as the fastest flying boat ever built in America. Designed for cargo and combat duty, the Model 31 weighs about 25 tons, is powered by two 2,000 h.p. motors. Mass production of it is planned for Consolidated's New Orleans plant. Actual speed, capacity, range—the Japs would like to know, too.

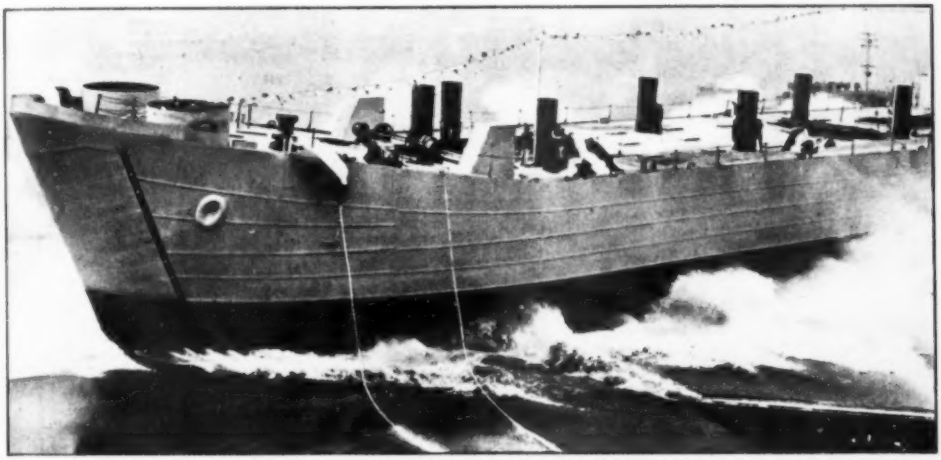
New Eyes For Britain's Navy

RECENTLY disclosed to be on active service with Great Britain's Royal Navy is the Curtiss SO3C-1 Seagull, left, called by the British the "Seamew." Fast and long-ranged, the Seagull is usually equipped with a large center float and two smaller wing floats, for operation by catapult from battleships or cruisers as a scout observation plane; equipped with landing wheels, however, it can operate from land bases or carriers.

A 90,000-Ton Kangaroo

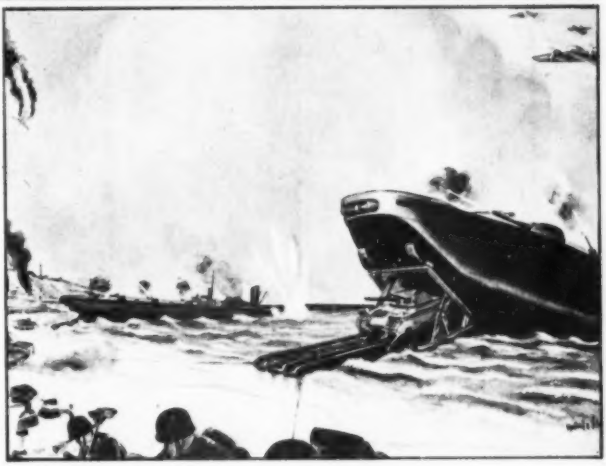
FROM the British magazine "Argus" comes this design, at right, for a super-warship, to carry planes, four-man submarines and torpedo boats for combined air, sea and undersea attacks against distant enemy bases. Specifications include: 90,000 tons displacement, 380,000 h.p. to give a speed of 50 knots, four 20-in. rifles (bigger than any now in use) plus plenty of lesser armament. Name: ROO, after kangaroo

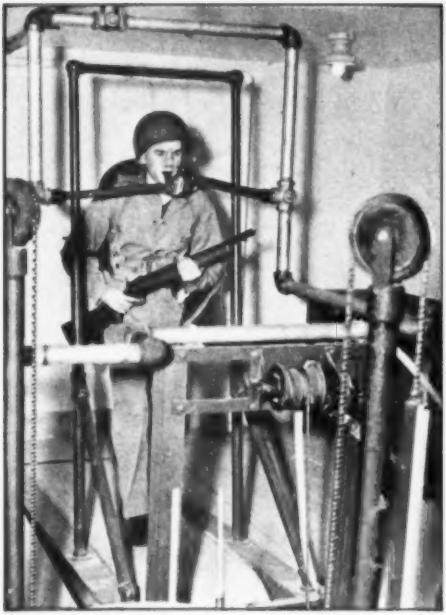




Where Have We Seen This Before?

A NEW type of tank landing ship slides down the ways of a nine-month-old Navy shipyard in Pennsylvania, *above*. It is believed to be the first of its kind to be launched; details of its construction, speed, range and capacity are secret. Note its similarity, however, to the tank carrying ship of Martial and Scull, New York industrial designers, drawing of which is reproduced at *right* from the March, 1942, issue of MECHANIX ILLUSTRATED.





Guadalcanal In Maryland

THE Marine above might be marching through tropical jungle or Arctic snows, all without moving a yard, in the new treadmill chamber of the Naval Research Laboratory at Bethesda, Maryland. Simulating weather for any theater of war, this apparatus enables physicians to study physical reactions of troops in strange climates.

Fashion For North Africa

THIS is the first released picture of the equipment carried by U. S. troops landing in North Africa. It includes: two water canteens, water-purifying tablets; all-purpose goggles; intrenching shovel; hand grenades; submachine gun; insect repellent; sandfly gloves; messkit; gas mask; raincoat; field rations; and, last but not least, ammunition.

"If You Don't Know You Get Killed"

THE tired bag of straw for bayonet practice is being replaced in many Army camps by lively dummies of the type pictured at left. Operated unpredictably by an instructor, this dummy is no pushover, can deliver a nasty whack or thrust with its broomstick "arm" to defeat an unskilful trainee. Result: soldiers learn defensive bayonet tactics as well as lunging.

Afrika Korps Sunday Punch

ABOVE is one Nazi weapon United Nations forces have been meeting in North Africa. It's a 150 mm. self-propelled gun—bigger than any self-propelled gun the Allies are known to have. But not big enough.

Russians Ruin The Blitz

ONE reason Russians can move so fast in winter snows is the motorcycle, *above*, equipped with outriggers. *Below*, a lightweight, two-man anti-aircraft rifle.

HOW STRONG IS AN ARMY?

It's not just superiority of equipment that brings victory in battle. Equally important is the *marksmanship* of each individual fighter.

It's a mighty good thing that so many Americans have acquired skill in marksmanship through the sports of hunting and target shooting.

The Stevens rifles and shotguns used by these shooters have rendered a service that's now proving its value on battle fronts the world over.

Right now Stevens is naturally producing large quantities of military equipment. After Victory, you will again have the same wide choice of models, at the same outstanding *values* that made Stevens one of the largest producers of sporting arms in the world.

J. STEVENS ARMS COMPANY
Division of Savage Arms Corporation
Chicopee Falls, Mass.

Shown at left—
No. 84 REPEATING .22 RIFLE
Famous for exceptional accuracy in the light rifle field.

STEVENS

—Just In Case

LIFEBOATS of Britain's Merchant Navy these days are ready for anything. Each lifeboat now carries three times as much water as in peacetime, has its water tanks fitted with dippers and cups marked off in ounces, *left*. Tapered plugs of soft wood, *right*, are carried to make repairs if the boat should be damaged by machine-gun fire.

A Life-Raft That Launches Itself

PICTURED in the drawing at left is the instant, life-saving operation of a new self-launching, self-inflating rubber raft developed to aid pilots forced down at sea. Actuated by a water-sensitive switch on the bottom of the fuselage, a hatch opens the moment the plane hits the sea and ejects the life-raft, which is immediately inflated by gas from a carbon dioxide cylinder attached to it, the valve of which is opened by the action of the hatch. The raft is attached to the plane by a light line.

Ear In A Pillbox

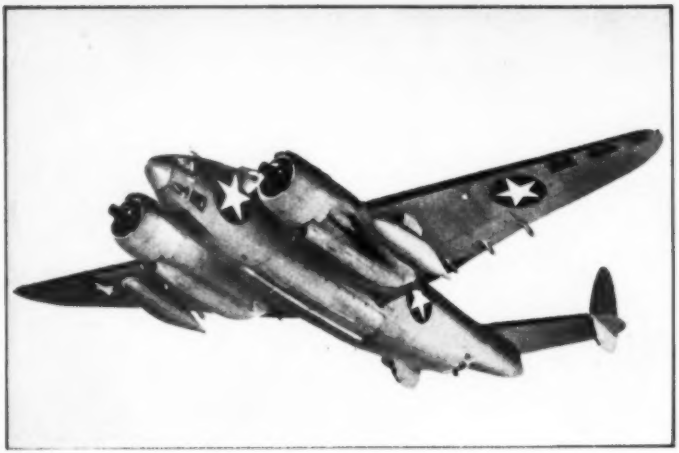
THE concrete chamber pictured above houses no machine-guns, but microphones for testing the accuracy of Army bombardiers by the new "Sonic System." Bombs landing near this target set up fast ground vibrations, and slower sound waves in the air. The microphones pick up both, thus determine just where the bomb hit.

Soldier Counts His Shots

STAFF SERGEANT MELVIN WOLFE, above, got tired of counting out by hand BB pellets for the Air Force gunnery range; so he invented this machine to do it for him. Built of a solenoid from an old machine-gun, a vibrator motor and assorted scrap, the device counts exactly 100 shots, and deposits them in a container, ready for use.

Up From The Scrap Pile

NOT long ago a scattering of junk lay wasting on the dump behind Fort Warren, Wyoming. Then the boys of the Quartermaster Training Center there went to work. Out of various parts of worn-out trucks, pieces of pipe, sections of old buildings which had been torn down, they put together the boom-truck pictured at right, capable of lifting seven tons. Valued at $10,000, it cost just $50 to build.

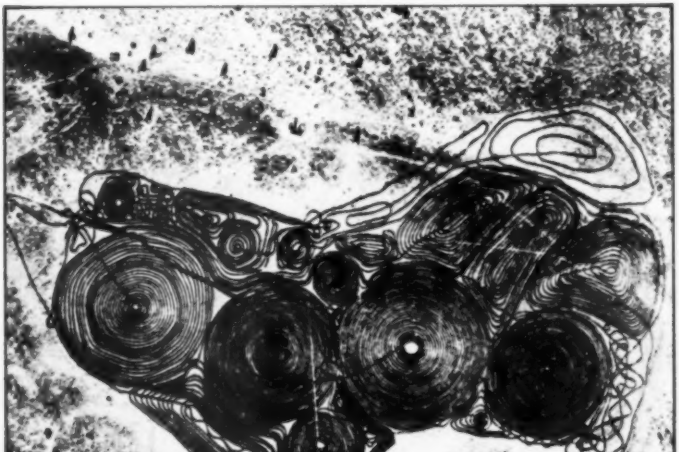


Ventura Goes To Sea

A NEW version of the Vega Ventura bomber is the PV-1, at left, now being built in quantity for the U. S. Navy. Designed for both patrol work and attack, it is capable of carrying depth charges or torpedoes for use against enemy vessels, has been given long range by the addition under its wings of droppable gas tanks.

They Let This Kind Down Easy

AT RIGHT is the first released picture of one of the parachute bombs which the R. A. F. has been using for several months in its stepped-up bombing of Germany's industrial centers. Descending slowly, these bombs do not penetrate the ground when they hit, launch their explosive force horizontally.

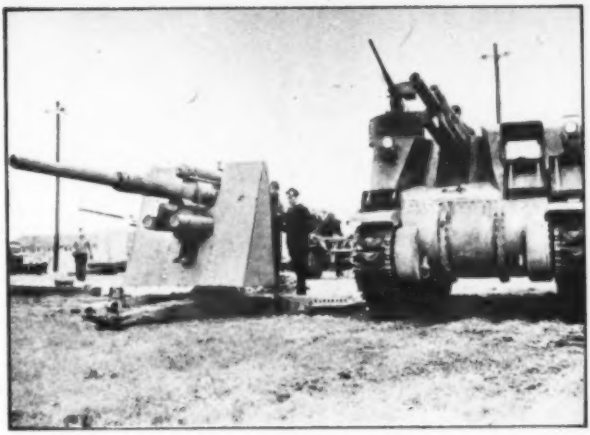


Can You Figure Out What It Is?

AIR Intelligence officers of Britain's Eighth Army were puzzled by the picture at left when they first saw it, but they soon solved the problem. It's an Axis desert airfield which the fleeing Nazis had plowed up, in an attempt to make the field unusable. Probably their work was wasted, for a field like this could be smoothed out again in a few hours.

Rival Sluggers Take A Bow

IN THE picture at right the German 88 mm. gun, left, which in its war debut surprised and smashed a force of nearly 300 British tanks in Cyrenaica, lines up beside the weapon that finally took its measure—the U. S. M-7 tank destroyer. Fast-moving, the M-7 mounts a 105 mm. gun-howitzer, is well liked by the men of Britain's Eighth Army, who call it "The Priest."

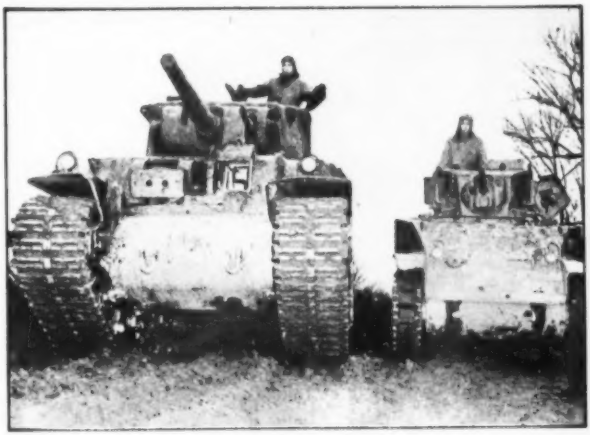


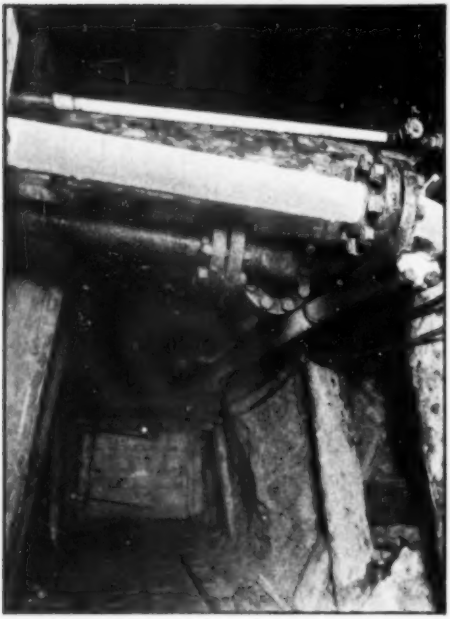
An Igloo For The Air Forces

A NEW type of portable shelter has been developed for Army Air Corps men stationed in Arctic regions. Designed to save weight and shipping space, these shelters can be put up by four men, easily moved if necessary. Their walls and plywood floors incorporate blankets of glass fiber insulation so efficient that the new shelters can be heated with only one-fourth the fuel required by older types.

Heavyweight And Bantam Of The Armored Force

AT RIGHT is shown how the Armored Force's giant M-6 tank, weighing 60 tons, compares with its new 15-ton M-5. Though verdicts on both models must await their performances in battle, the M-6 is heavier and probably faster than the famed German Mark VI. No nickname has been given the M-6 yet; "Junior" is tentative for its little brother.





Air-Conditioning A Mile Down

IN ANACONDA COPPER'S mine in the "richest hill on earth" near Butte, Montana, air-conditioning is doing a job for war. By cooling shafts and tunnels as deep as 4,500 feet, where normal temperature runs as high as 130 degrees Fahrenheit, it adds thousands of tons of precious copper to U. S. metal production. Above left, insulated pipes bring cold brine from the surface to the deep levels; right, tunnel air is washed before cooling.

. . . And Air-Cooling For Gloves

TO MISS ELIZABETH MEISTER, nurse in the Westinghouse Lamp Division, goes full credit for a unique contribution to plant safety. In a beauty parlor one day she observed the operator's use of an air blower for drying hair, she says, "And it occurred to me that there was a good system for our workers who handle hot glass lamps, as they sometimes received slight burns. I suggested that their asbestos gloves be air-cooled; since then we've not had a single burn."

Gears For War Power

PICTURED above is a technician checking with a micrometer the accuracy of giant propulsion gears for one of Uncle Sam's new battleships. Tolerance in these gears are measured in ten-thousandths of an inch.

Cats Don't Need These

DESIGNED for use in blackouts, these spectacles, invented by Dr. Maxwell Miller, of New York, have bulbs set in their rims. A similar invention was recently patented by Anastios Dritas, of Chicago.

Plastic Foils For Bugs

PRESSURE of wartime metal conservation has led to the development of window screens made of plastic, *right*, which now turn out to be better than the metal ones were in the first place. Said to be just as strong against injury as their metal counterparts, these plastic screens do not burn, rust or corrode, are impervious to the effects of sunlight, salt air, rain and even most ordinary chemicals. Fadeless colors can be incorporated right in the plastic.

Something The Children Will Be Glad (?) To Hear About

SICK schoolchildren in Newton, Iowa need no longer fall behind in their studies. Intercommunicators owned by the town can be installed in any home with a telephone line, enable shut-ins not only to hear their teachers, but even ask questions.,

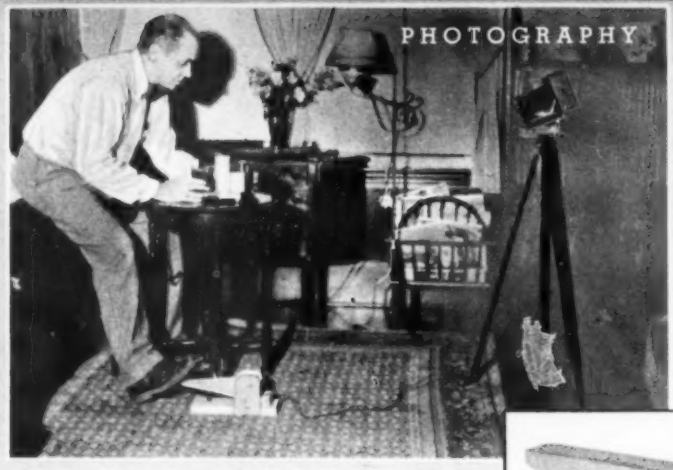
Mechanical Brain Joins The Artillery

AT LEFT Raymond Clapper, noted columnist, and Major General Levin H. Campbell, Jr., Chief of Army Ordnance, inspect a Differential Analyzer. Popularly known as the "mechanical brain," the differential analyzer is used by artillerymen to solve complicated calculus equations for gun firing data, can do in a few minutes computations which would take an expert human mathematician several weeks.

CRAFTS AND HOBBIES

Plant stand from old sewing cabinet. See page 98

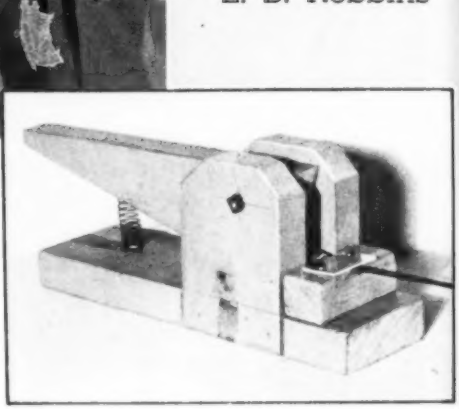
PHOTOGRAPHY • MODELS • AUTOS
THE HOME WORKSHOP • FURNITURE
VICTORY GARDENS • SCHOOL SHOP
WOOD AND METAL WORKING • TOYS



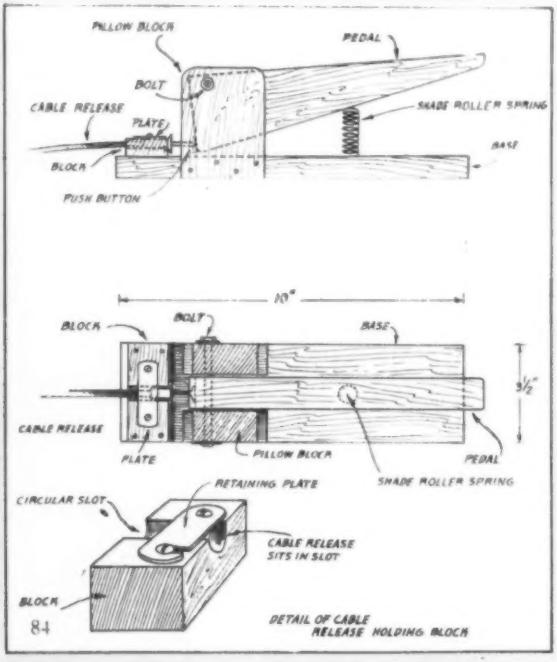
The use of the remote pedal release is demonstrated above. Close-up at *right* identifies most of its essential features.

REMOTE PEDAL RELEASE

by L. B. Robbins



THE free-lance writer who makes his own progress illustrations often has to double as photographer and model. In such cases, a self-timer of some kind is essential. A remote, foot-operated cable release like the equipment described here will be found more practical than any other gadget of the kind for it permits the operator to make the exposure at the critical instant.



To operate the device, the photographer need only insert an extra-long cable release in the camera in the usual way and fit the plunger end into the operating section of the pedal release as diagrammed at the left.

The base of the pedal release is made of 1⅛-inch wood 10 inches long by 3½ inches wide. Two inches from one end, mount two pillow-blocks of the same material 4 inches high and set into the edge of the base as shown. This leaves sufficient space for a pedal of 1⅛-inch stock to swing between them without binding. The pedal is pivoted on a bolt running through it and the two pillow-blocks. The lower corner of the rear of the pedal is allowed to clear the base by a fraction of an inch.

A piece of window-curtain spring inserted vertically between the pedal and [*Continued on page* 132]

All essential construction details for the remote pedal release are outlined in detail at *left*.

PHOTO CONTEST

FIRST PRIZE ($10.00): "Hey Bud!" by Keith W. Jones, 716 So. Harvard Avenue, Villa Park, Ill. Taken with a Graflex D, on Panatomic X film; f/22, open flash with 2 SM bulbs. SECOND PRIZE ($5.00): "Big Girl" by John Stewart, Box 443, Sinton, Texas. THIRD PRIZE ($4.00): "Swing" by Julius W. Homoly, 3202 S. 53rd Ct., Cicero, Illinois. FOURTH PRIZE ($3.00): "The Kiss" by Joseph Adams, Box 424, Manchester, Conn.

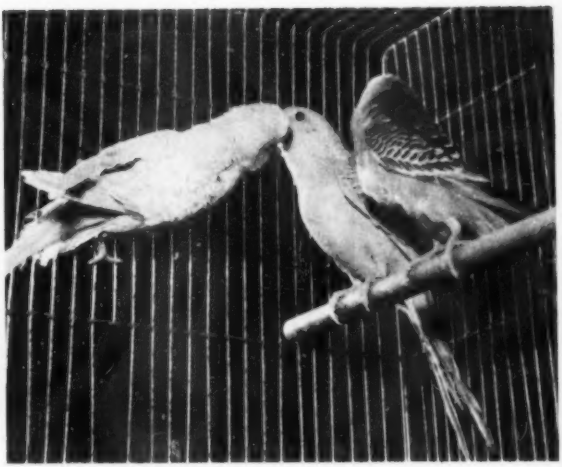
Submit prints for this month's contest unmounted—no larger than 8x10 inches. With each print, list your camera, film, lens opening and shutter speed, illumination, and developer. Write your full NAME and ADDRESS on the back of each print, and wrap securely with cardboard or corrugated stiffeners. If you want unused prints returned, you must enclose return postage. (Published prints can not be returned.) Address: Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

1st PRIZE

2nd PRIZE

4th PRIZE

3rd PRIZE



HOME-LAMP PH

by Glenn Mentch

FIG. 1 *(left)*: How a pair of home lighting lamps in cardboard reflectors may be arranged for photographic lighting—main light on stand; fill-in is just a bit to the left of the "cameraman" just above camera level.

FEW of us realize the full scope of war photography in the combat zone, on the production line, and on the home front. However, photography contributes in so many ways to the war program that we can readily understand the War Production Board's limitation on the sale of photoflood and photoflash lamps. Although flood and flash lamps have long been the mainstay of indoor photography, a wide variety of pictures can be made using the available, *long-life* home lighting lamps.

The accompanying lighting suggestions and exposure data are given in the interest of indoor pictures with home lighting lamps, either in photographic reflectors or by existing conditions of illumination. The exposure data are based on the use of a high speed panchromatic film, the

TABLE I

EXPOSURE WITH HOME LIGHTING LAMPS

IN PHOTOFLOOD REFLECTORS

High-speed panchromatic film (Kodak Super-XX)

Lamp to Subject Distance	Lens Opening	-- Exposure in seconds -- (1 60-watt* (1 100-watt	(1 100-watt* (1 200-watt	(1 150-watt* (1 300-watt
4 feet	f/4	1/25	1/50	1/100
	f/5.6	1/10	1/25	1/50
	f/8	1/5	1/10	1/25
	f/11	1/2	1/5	1/10
	f/16	1	1/2	1/5
5 feet	f/4	1/10	1/25	1/50
	f/5.6	1/5	1/10	1/25
	f/8	1/2	1/5	1/10
	f/11	1	1/2	1/5
	f/16	2	1	1/2
8 feet	f/4	1/5	1/1	1/25
	f/5.6	1/2	1/5	1/10
	f/8	1	1/2	1/5
	f/11	2	1	1/2
	f/16	4	2	1

* Use lower wattage lamp as camera light and higher wattage lamp as side light -- both lamps at the same distance. Side light is placed about 45° to the camera axis, and 2 feet higher than the camera. When side light is 45° - 90° to camera axis, use 1/2 larger lens opening. Beyond 90°, use full opening larger.

Exposures are given for light-colored interiors; use one lens opening larger for dark-colored interiors.

With double lamp wattage, use one lens opening smaller.

Important: The light from both lamps must be superimposed on the subject.

With side light of the same wattage as camera light, place side light at 2/3 camera-light distance.

Note: The use of home lighting lamps for photographic work does not shorten the normal long life of these lamps.

TABLE II

EXPOSURE WITH HOME LIGHTING LAMPS

WITHOUT REFLECTORS (550-watt total)

Kodak Super-XX Film

Average Distance Lamps to Subject	Lens Opening	Exposure in Seconds
6 feet	f/4	1/10
"	f/5.6	1/5
"	f/8	1/2
"	f/11	1
"	f/16	2
8 feet	f/4	1/5
"	f/5.6	1/2
"	f/8	1
"	f/11	2
"	f/16	4

This table is for portraits and light-colored interiors. For dark-colored interiors, use one lens opening larger.

PHOTO LIGHTING

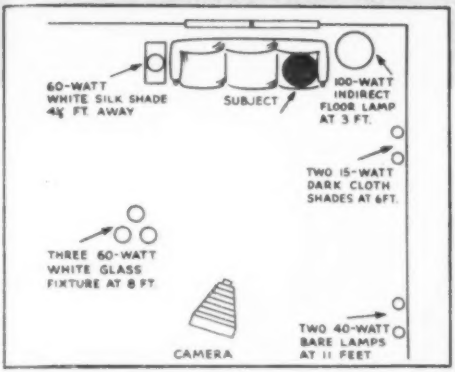


FIG. 2 *(right)*: Home portrait exposed by ordinary low-powered home lighting lamps, arranged as in above diagram; the camera position was to the right of that indicated, however. Exposure: f 5.6 at ½ second, on Super XX film, based on Kodak Home Lighting Guide (page 88).

speed and color sensitivity of which are desirable for this class of photography.

Photographic reflectors should be used wherever possible. They increase the efficiency of the lamps by directing the light on to the subject. They also prevent direct light from striking the camera lens, thus helping to reduce flare, and provide a method of holding the lamps conveniently.

In using home lighting lamps for photography, it is desirable to have a pair of lamps with a wattage ratio of about 2:1. This gives good lighting balance and adequate modeling when properly arranged around the subject. These combinations are suggested: 60-watt, 100-watt; 100-watt, 200-watt; 150-watt, 300-watt (medium screw base).

You may arrange the lighting units in the same way as when using floodlamps. Place the lamp of lower wattage beside the camera at about the height of the camera lens. This unit is generally referred to as the camera light. At an equal distance from the subject, and about 45° on the other side of the camera axis, place the lamp of higher wattage. This unit may be referred to as the side light, and it is normally 2 to 3 feet higher than the camera lens.

The side light can be used at more or less than 45° from the camera axis. Most workers first arrange the subject as desired; then set the side light to pass over the subject's nose and highlight a triangular area on the sub-

FIG. 3. Exposure made by open sky light coming through the window, combined with a supplementary fill-in light placed to the left of camera, indoors.

FIG. 4. Home family group photographed by two home lighting lamps in metal reflectors such as were formerly used for flood lighting. Main light was high and to the left; fill-in light-and-reflector was placed close to and a bit to the right of the camera.

FIG. 5 *(below)*: 10c guide which facilitates exposure choice.

ject's far cheek. Interesting backlight effects can be obtained by using an additional lamp above and to the side of the subject. The lamp should be directed to highlight the subject's hair and to lighten the background. This gives a separation of subject and background and results in better hair rendition, especially with brunettes. Additional background lamps are not considered in exposure calculation.

The distance from the lamps to the subject is the important factor in determining the correct exposure. Lamp to subject distance should be measured carefully. This is especially critical at low levels of illumination.

See Table I for exposure with home lighting lamps in photographic reflectors.

If necessary, you can use home lighting lamps without reflectors. However, it is difficult to control lighting effects. In general, you should select enough lamps to total 350 watts, placing about 250 watts on one side of the camera axis, and 100 watts on the other, with all lamps at about the same distance from the subject. When bare lamps are used without reflectors, the camera lens must be shielded by a card or screen placed between lamps and lens. [*Continued on page* 132]

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PHOTO KINKS

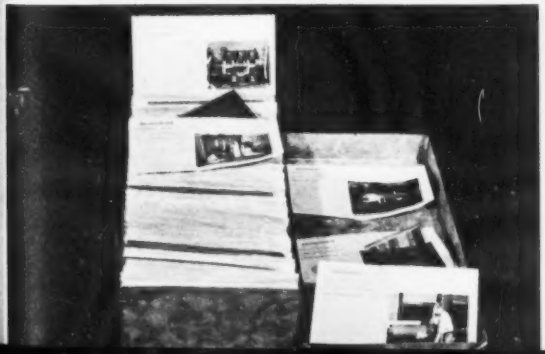
INEXPENSIVE FOCUSING MAGNIFIER. Facilitate ground glass focusing with a simple magnifier made from a 35mm film cartridge can, a magnifying lens with 2¼" focus, and rubber tape. Cut a hole slightly smaller than lens diameter in the container bottom and lid, then place lens against the bottom with the cut-out lid over it (above). Wrap tape around the open top of can to serve as a cushion. If necessary trim bottom of can or increase its length with tape to bring about optimum focus of the lens—*Walter E. Burton.*

Right: An excellent substitute for costly filter paper will be found in the form of diaper linings (not disposable paper diapers!) used as illustrated. Be sure to get a high-quality cellulose fibre which will be found strong enough to be used in a single thickness.—*Philip B. Sharpe.*

Below: Avoid discoloring washbowl marble when discarding solutions by pouring out the latter via a funnel inserted in a bored-out sink plug as shown.—*Halleck McCord.*

Right: **The tendency of tripod legs to stick when extended can be overcome by applying "no rubbing" type floor wax to the sliding surfaces with a clean rag.—*Louis Hochman.***

Below: **A handy file for negatives smaller than 4x5 inches can be made from No. 5 envelopes (25 for 5c) fitted in a cardboard or metal box. Place the negative in the envelope, and paste a contact print on the outside along with the date, location and other subject and technical data.—*J. L. Braswell.***



YOUR VICTORY GARDEN

Help alleviate the food shortage at home and abroad by growing some of your supply.

by
Roland Cueva

Above: This sign proudly proclaims the fact that its owner is doing her share toward raising more food for the nation. *Right:* Rows are made straight and even by means of a taut cord. Don't sow seed too deeply or it won't sprout.

Typical seed assortment for Victory garden includes beets, carrots, turnips, lettuce, chard, beans and tomatoes.

"LET me have two cans of string beans and one of tomatoes, please."

The grocer smiled at the young housewife, then eyed his point-value table.

"Good thing you came in early," he said, "we have only a few cans of those particular vegetables left. That'll cost you—let me see—just 40 points. Why, ma'am, you'll be using up almost your whole quota; maybe you should pick out something lower in points but still high in vitamins."

Conversations like the above will become commonplace this spring as point rationing brings home to many people, particularly city dwellers, the fact that food does not just grow on grocers' shelves. For the first

Setting out a tomato plant. "Collar" of paper or screening prevents cutworms from getting at stem and chewing through.

Right: Chicago is stopping at nothing. Here's a garden being started at the foot of skyscrapers in the heart of the fashionable Lake Shore section. It's a cooperative proposition.

time, perhaps, we are beginning to realize the tremendous problems involved in wartime raising and marketing of that which we used to merely walk into a store and buy—without a second's thought.

The realization will do us much good—we'll want to learn all about the minerals and vitamins contained in different fruits and

PLAN FOR AVERAGE SMALL GARDEN, 14 ROWS

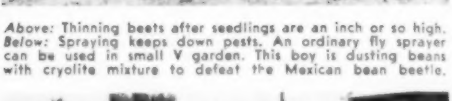
Feet between rows	Vegetable	
2	(POLE SNAP BEANS)	Kentucky Wonder; ¼ lb. seed — After harvesting beans follow with 3 rows of TURNIPS; ½ oz. seed.
2	(POLE SNAP BEANS)	
2	(POLE LIMA BEANS)	Carolina or Sieva; ¼ lb. seed
2	(POLE LIMA BEANS)	
2½	(TOMATOES (staked) Earliana; 2 doz. plants	N. or W.
3½	(TOMATOES (staked) Marglobe; 2 doz. plants	
2½	(CHARD ½ row Fordhook Giant; ½ oz. seed. LETTUCE ½ row; 1 packet seed. (In late July follow lettuce with ½ row CARROTS; 1 packet seed)	
1½	(BEETS Early Wonder; ½ oz. seed	
1½	(CARROTS Chantenay or Nantes; 1 packet seed	After harvesting follow (Aug. 1) with 2 rows COLLARDS; 1 packet seed.
1½	(TURNIPS Shogoin; 1 packet seed	
2½	(CABBAGE Golden Acre; 30 plants	After harvesting, follow with 3 rows Detroit Dark Red BEETS; 1½ oz. seed.
2	(ONIONS (yellow) 1 pint sets	
1½	(RADISHES Scarlet Globe; 2 half-row plantings 10 days apart; ½ oz. seed	Follow with 2 rows U. S. No. 5 Refugee BEANS; ½ oz. seed.
1	(SPINACH Long Standing Bloomsdale; ¼ oz. seed	
2		

Fig. 1: Chart above gives layout and produce suggestion for a plot measuring 50 feet long by 30 feet wide.

Photos from U. S. Department of Agriculture

Wheel hoe is nice luxury if you have one. You won't need it though, unless your garden is a fairly large one.

Above: Thinning beets after seedlings are an inch or so high. *Below:* Spraying keeps down pests. An ordinary fly sprayer can be used in small V garden. This boy is dusting beans with cryolite mixture to defeat the Mexican bean beetle.



vegetables so we can eat as well or better than before with less variety and quantity to choose from. We'll also want to share the kick and health benefits that our neighbors will be getting from their own fresh Victory garden vegetables; and at the same time help the boys overseas win the war.

This year the Department of Agriculture, headed by food administrator Claude Wickard, has launched an official Victory garden program—the goal, 18,000,000 Victory gardens, one third on farms and two-thirds in metropolitan and suburban areas.

Planting and growing a successful V garden is not difficult, and is great fun. Anyone having access to a plot of good soil, however

FIG. 2: HERE ARE VITAMIN AND MINERAL VALUES OF V GARDEN VEGETABLES.

Kind of vegetable	Vitamin A	Thiamine (Vitamin B_1)	Ascorbic acid	Riboflavin (Vitamin G)	Calcium	Iron	Energy value
							Calories pound
BEANS, LIMA (green)		EXCELLENT		GOOD		EXCELLENT	595
BEANS, SNAP	EXCELLENT	GOOD	GOOD		GOOD	GOOD	190
BEET GREENS	DO			EXCELLENT		EXCELLENT	150
CABBAGE		GOOD	EXCELLENT	GOOD	GOOD		130
CARROTS	EXCELLENT	DO		DO	DO		205
CHARD	DO				EXCELLENT	EXCELLENT	115
COLLARDS	DO	GOOD	EXCELLENT	GOOD	DO	GOOD	225
CORN, SWEET		DO					510
KALE	EXCELLENT	DO	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	225
LETTUCE, GREEN	DO	DO		GOOD	GOOD	GOOD	85
PARSNIPS		DO	GOOD		DO		380
POTATOES		DO	DO				385
SPINACH	EXCELLENT	DO	EXCELLENT	GOOD		EXCELLENT	110
SQUASH, HUBBARD	DO						200
SWEETPOTATOES	DO	GOOD	GOOD				565
TOMATOES, RED	DO	DO	EXCELLENT				105
TURNIP GREENS	DO	DO	DO	EXCELLENT	EXCELLENT	EXCELLENT	165
TURNIPS, WHITE			DO		GOOD		155

FIG. 3: APPROXIMATE PLANTING TIMES FOR VEGETABLES.

Early-spring plantings		Late-spring or summer plantings		Late-summer or fall plantings (6 to 8 weeks before fall freeze)
4 to 6 weeks before frost-free date	2 to 4 weeks before frost-free date	Frost-free date	2 to 6 weeks after frost-free date	
CABBAGE PLANTS. LETTUCE. ONIONS. PEAS. POTATOES. SPINACH. TURNIPS.	BEETS. CARROTS. CHARD. LETTUCE. MUSTARD. PEAS. PARSNIPS. RADISHES.	BEANS. BEETS. CORN, SWEET. SQUASH. TOMATO PLANTS.	BEANS, SNAP BEETS. CORN, SWEET. SWEETPOTATOES.	BEETS. COLLARDS. KALE. MUSTARD. SPINACH. TURNIPS.

small, can climb on the V garden bandwagon and enjoy the fruits of his labors this summer. It doesn't take much time, either: a couple of days for the preparation, then a few hours a week out-of-doors for the upkeep, after the plants are well started.

No matter where you live you can have a garden. Farmers, of course, will not need advice, and if you are a suburbanite the chances are you'll have access to a convenient site; but even city apartment dwellers can V garden this spring. Many cities are making space in parks and school grounds available. Owners of vacant and undeveloped properties are volunteering them for garden use through real estate operators and local Victory garden councils. Apartment house proprietors are locating suitable plots and turning them over to their tenants on a cooperative basis. If you haven't your garden plot yet, go at once to your local Victory garden organization and ask about it. They probably have a community or allotment project in which they'll be glad to have you share.

Assuming that you can take care of the terra firma question, the first thing that comes to mind probably is, "What shall I plant?"

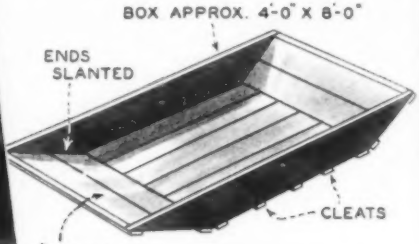
This will depend to some extent on the size of the garden and type of soil and climate. Carrots, for instance, will grow in almost any sunny location, but do best in light, sandy soil. Generally speaking, it will be wise to concentrate on green and leafy vegetables, yellow vegetables and tomatoes. These varieties are rich in mineral and vitamin content and usually yield heavily in proportion to square footage. Snap beans and tomatoes are [*Continued on page* 134]

Kind of vegetable	Minimum space between rows	Distance between plants in row	Seed required to plant 100 feet of row	Depth to cover seed
	Inches	*Inches*		*Inches*
BEANS, LIMA (pole)	24	24	¼ pound	1
BEANS, SNAP (pole)	24	24	¼ pound	1
BEETS	14	2-3	1 ounce	1
CABBAGE	27	15-24	[1] 50-90	
CARROTS	14	2-3	¼ ounce	½
CHARD	18	4-6	1 ounce	1
COLLARDS	18	15-18	1 packet	½
CORN, SWEET	36	15	¼ pound	1
KALE	18	12	1 packet	½
LETTUCE	15	12	1 packet	½
MUSTARD	15	4-6	¼ ounce	½
ONIONS	14	2-3	1 quart [2]	½
PARSNIPS	18	2-3	½ ounce	½
PEAS	18	1	1 pound	1-1½
POTATOES	24	12	6-8 pounds	4
RADISHES	12	2	1 ounce	½
SPINACH	12	3-4	½ ounce	½
SQUASH, HUBBARD	100	30	1 ounce	1-1½
SWEET POTATOES	36	15	[1] 80	
TOMATOES (staked)	36	24	[1] 50	
TURNIPS	14	2-3	¼ ounce	½

[1] Plants [2] Sets

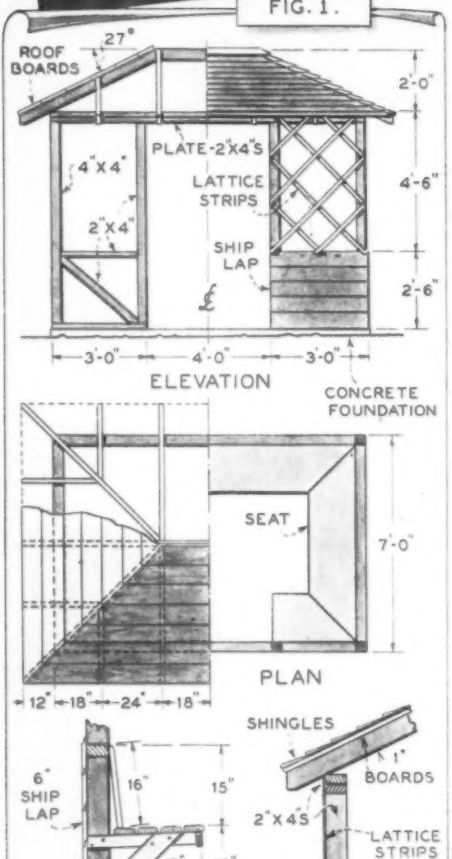
Fig. 4: Seed should be conserved by buying only enough for immediate needs, then sowing carefully. This chart shows how much you'll require of each to plant 100 of row.

SUMMER HOUSES



MIXING TROUGH

FIG. 1.



THIS summer, with pleasure driving taboo and all vacation travel cut to a minimum you'll be spending more of those day-off afternoons at home, and a nice cool spot to lounge in on the hot ones will be most welcome. Little expense is involved in building an attractive and inviting summer house that will supply the "cool spot" and at the same time doll up your lawn or garden, for you can utilize scrap lumber and other materials.

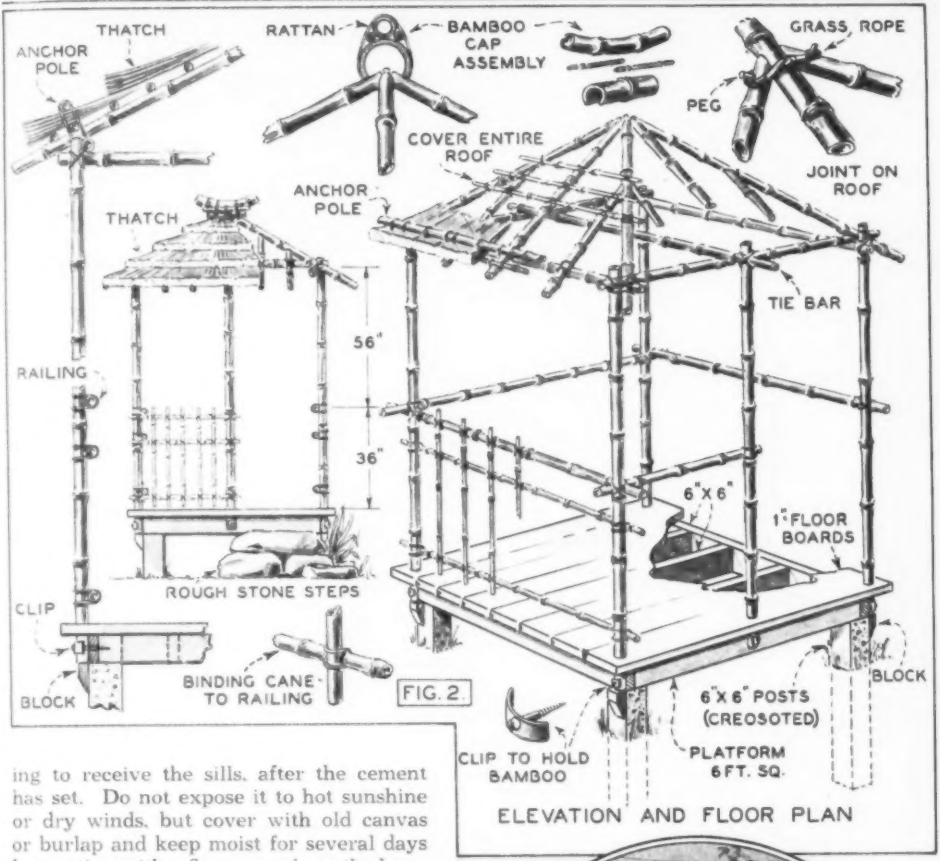
You can set up one of the lattice houses or pergolas illustrated here in your spare time, without fancy tools or special experience—when the evenings get long and light you'll find excellent relaxation in just building the thing, not to mention using it.

In Fig. 1 is a well sheltered but airy structure which occupies only seven by ten feet of ground space, and its lines can be softened by climbing vines. Concrete is always recommended for summer house floors as it permits a lower building than a wood floor, is permanent and is not damaged by rain or snow, which inevitably blows in an open structure of this sort. A six-inch-deep excavation is made in the ground and rough wood forms staked around the edges. Sometimes one can rent a small power mixer, but if not, build a mixing scow about 4 ft. wide by 8 or 10 ft. long. The ends should slope so that it will be easy to get all of each batch out. Satisfactory concrete can be made by using two parts clean, sharp sand and three parts of gravel, or aggregates, to each sack of cement. If the aggregates are moist, only 4¼ gallons of water per sack are required, if dripping wet, only 3¾ gallons. Dry aggregates require about 5½ gallons of water. This cement-sand-gravel ratio is known as the 1:2:3 mix.

While the concrete is still soft, anchor bolts can be forced down in, with 2½-in. protrud-

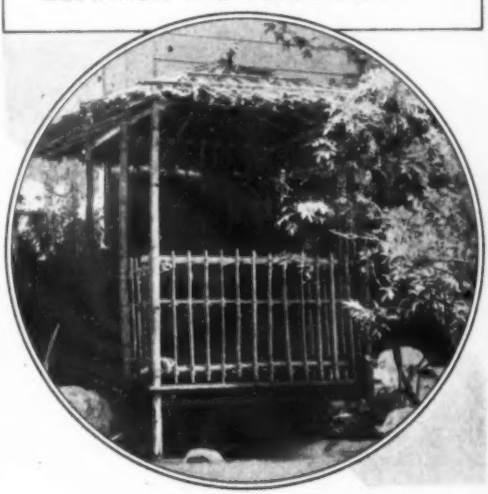
FOR SUNNY LAWNS

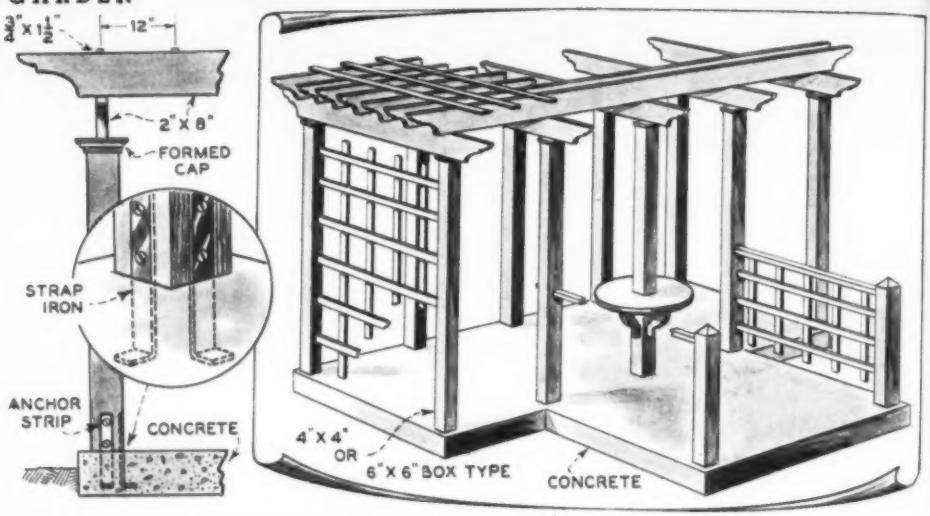
by Hi Sibley



ing to receive the sills, after the cement has set. Do not expose it to hot sunshine or dry winds, but cover with old canvas or burlap and keep moist for several days by wetting with a fine spray from the hose.

When the concrete is dry the wall frames may be built flat on the floor, then erected and bolted to the concrete. Note that a short diagonal brace is used in the corner. Longer ones from floor to eaves are not necessary since the diagonal lattice serves the same purpose. The hip roof is built as illustrated in the plan and has 12-in. overhang at the eaves. Shingles laid irregularly are more interesting on this type of structure than on a conventional design. Lap siding is used as shown and inside a bench is built around three walls, giving plenty of room for a rectangular table, which can be drawn up to one corner when serving lunch. This summer house is effective with an artificial weather stain, or painted white or green.





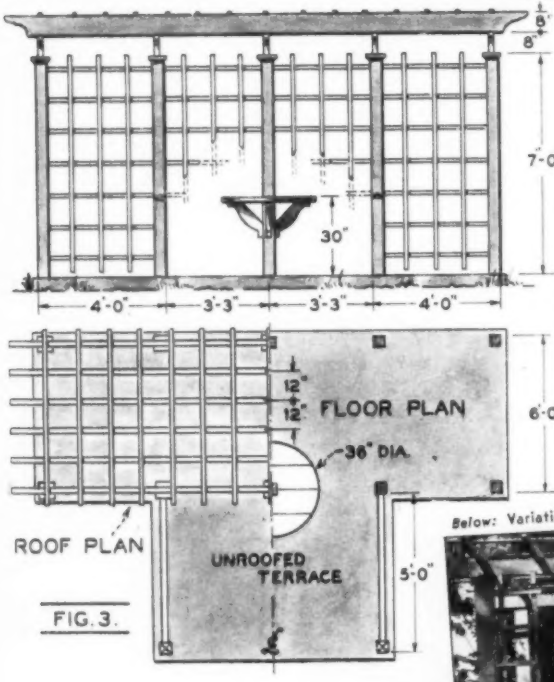


FIG. 3.

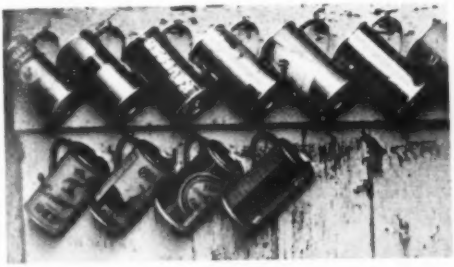
18-in. in the ground, after the lower ends are tarred or creosoted to forestall decay. At the corners bore for the four bamboo uprights which support the entire structure. These posts are supported on blocks nailed to the foundation posts and anchored with lag screws or through clips, as illustrated. Bamboo, of course, cannot be nailed without splitting, but by drilling small holes and inserting pegs, joints can be assembled by binding with grass rope. For the smaller assemblies, such as canes on the railing, raffia may be used. The roof-framing follows conventional practice except that bamboo [*Continued on page* 132]

Below: Variation of pergola above built around barbecue.

Bamboo Summer House

Where bamboo of fairly large diameter is available the Chinese summer house in Fig. 2 makes a picturesque feature for a corner of the garden, bordering a fish pond and with a background of shrubbery. First build a platform on four six-by-six-in. posts set

IDEAS for SERVICE MEN



FROM ALEXANDRIA, EGYPT, comes word that the "WEHOs" (Women's Emergency Helpers Organizations) now collect old empty beer cans which they pass along to a local tinker—for conversion into drinking mugs. After being cleaned, polished, and fitted with an appropriate tin-strip handle, the finished mugs are used in hospitals, trains, and battle-zone canteens.

A SHIELD FOR UNIFORM-BUTTON CLEANING is recommended by Herman R. Wallin, Washington, D. C. (illustrated below). Made of celluloid, thin metal, or a cut-film negative, the device has a channel and a disc-shaped cut-out to admit the button. Used as shown, it prevents the metal polish from slopping onto uniform material. Use razor blade for cutting out.

MISS ELIZABETH NUGENT of Yonkers, N. Y., has a nephew in the Service who has found a use for old tooth brushes. They re "just the thing" for cleaning out dirt and grit from his rifle action, and also make a handy cleaning oil applicator for scrubbing the outside of the rifle. (Pass the mouthwash, please.)

SERVICE MEN, ATTENTION!

This is *your* department, and if you like it enough to want to make it better, you can. It's all up to you! Send in your ideas—anything you think may help your buddies in the Army, Navy or Marines. You'll be helping yourself too, because MECHANIX ILLUSTRATED pays from $2.50 up for material used. Address "Ideas For Service Men," MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

NEW FURNITURE FROM OLD

WHAT YOU CAN DO WITH WORN OUT FURNITURE—This good-looking double duty desk was made from . . . the battered old "vanity" *below*. For other uses of desk and method of remodeling turn to pictures on next page.

PART II

by

Charles and Bertram Brownold

MOST houses have at least a few old pieces of furniture lying around that have apparently outlived their usefulness and seem destined for the scrap heap. Or perhaps they still have some life in them but are outmoded and present an eyesore to owner and visitor alike. In either case the pieces in question should be saved, for they can be dissembled or altered in such a way as to convert them into thoroughly attractive and up-to-date creations; a little paint, ingenuity and enjoyable work being the only requirements for the transformation.

Even if you don't happen to have any broken or otherwise undesirable furniture on hand you can still take part in this interesting and useful hobby, because quantities of discarded pieces are available at little cost from various charity or non-profit organizations having branches almost everywhere, such as the Salvation Army. In addition, you will be retrieving something that might other-

OUTMODED EYESORES BECOME MODERN UTILITY PIECES—Like the attractive plant stand at *left*, which was converted . . . from the ugly, discarded sewing cabinet pictured *below*. It has implement space in center.

Instead of building or buying new furniture, why not convert worn out or broken articles into sparkling, modern pieces that you'll be proud to own? You can do it easily, at little or no expense, using nothing but ordinary hand tools. Try it!

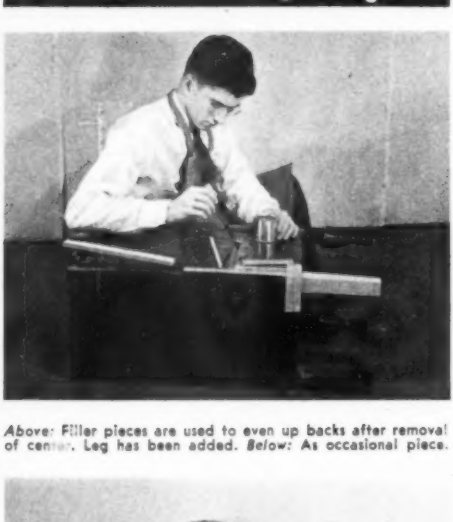
Left: Here's one of the authors, dwarfed by the pile of junked furniture obtained from a local non-profit organization for less than $15. All new pieces described in this and last month's article were made from it.

Left: With top panel lifted off, desk becomes two separate small tables or cabinets for bedroom or living room. *Above:* First step in conversion was to saw center section from vanity. Note chipped and split veneer on face of the drawers.

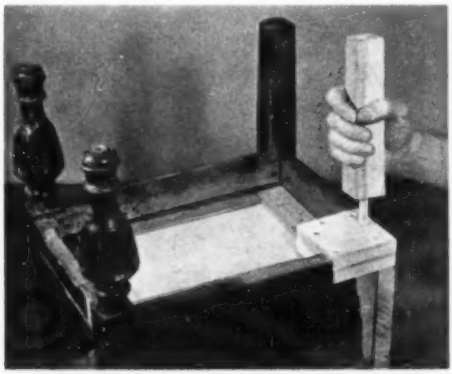
wise have been destroyed, and at the same time avoiding the use of new materials badly needed in the war effort.

In order to show readers of MECHANIX ILLUSTRATED what excellent results can be obtained in the way of making attractive pieces of furniture from junk, the authors went to a local non-profit organization and obtained half a truckload of material for less than $15 (shown in photo on page 99), put it out in the garage and got busy.

Part of the results were described and illustrated in the April issue of MI, and consisted of a magazine rack, hall shelf and umbrella stand, fashioned from some of the salvaged material. We continue in this second article with a really beautiful *plant stand*, made from an old sewing cabinet, and



Above: Filler pieces are used to even up backs after removal of center. Leg has been added. *Below:* As occasional piece.



Method of adding new leg is shown *above*. Filler blocks are screwed to bottom and leg doweled into them. Shape of the leg is determined by pattern taken from the other back leg.

Here's how sewing cabinet was changed into plant stand. *Above:* Drawers are removed and center ledge sawn out. *Right:* Section is removed from side (inside) to allow placement of glass dish to catch drippings when plants are watered.

a *double duty desk,* whose parent was an ancient vanity dresser. So far we've used only about half of the heap, and the further we go the more amazing becomes the variety of excellent remodelings that are possible. The chief trick is to study each piece carefully until its shape or construction suggests a pattern for the new creation, after which the actual conversion steps are easily figured out. No set rules can be established for procedure, as no two pieces of old furniture present exactly the same problems, but one stated generality may serve as a guide: Never break a piece apart—always remove fastenings or gently work on glued joints until they loosen; and avoid further marring of surfaces wherever possible.

Now you'll want to get on with the actual work, so let's go! [*Continued on page* 136]

Drainage holes are drilled after insides of plant "boxes" are painted thoroughly with asphaltum varnish for waterproofing.

Above: Doors made from old top, and rabbeted to overlap in center, are hinged on front over large compartment. *Right:* Working implements are kept in lower space. Glass drip dish is being inserted through opening cut in side for purpose.

HOW TO SAVE

Photos by Roy Lester

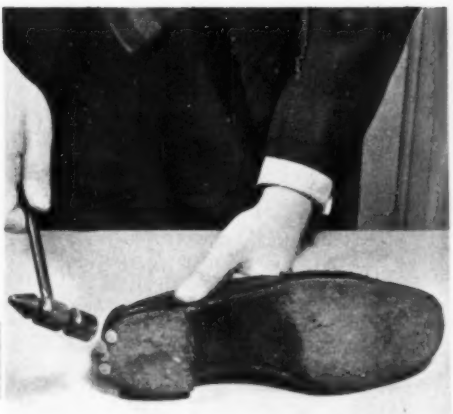
CARS may go off the roads, heat out of the homes and steaks disappear from the butcher's shelves, but all God's chillun still gotta have shoes! Maybe not so many, but they gotta have 'em.

And they can have 'em too, rationing or no rationing. There isn't the slightest reason to get upset over a shoe allotment of three pairs per year per person. Actually, that's ample for almost anybody, except a centipede, providing he takes reasonable care of the poor abused dogs.

It's no pun to say that the average individual gives his shoes a terrible kicking around, probably from force of habit in this land of ex-plenty, where replacements were seldom if ever a problem in the past. Now it's different though, and Joe Civilian is going to learn that he can get just about twice the wear from his shoes that he got back in the good old days of peace and waste.

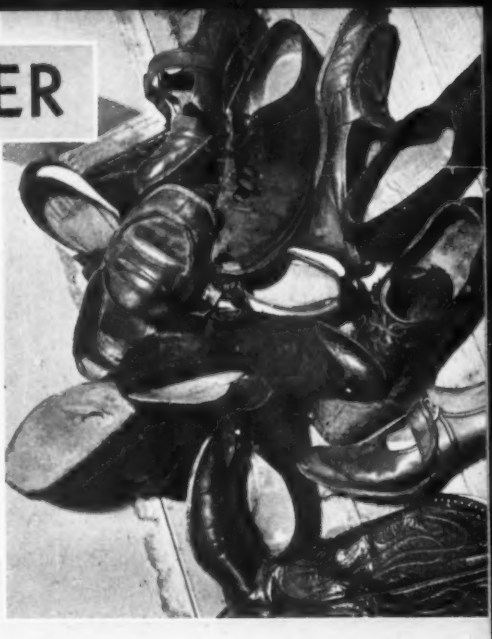
On these pages are illustrated a few ideas for conserving sole, heel and uppers leather. Some are novel, some old but seldom practiced, and all except one genuinely useful.

Yes, gentle reader, the picture above is intended as a gag—we don't believe there's anyone around who could walk on his hands consistently enough to save much shoe leather; it's an idea though! *Below* you see an excellent way to ruin a pair of wet shoes—just dry them on the radiator. At *right* is proper way. Stuff them with paper and put away to dry NOT near any direct heat.

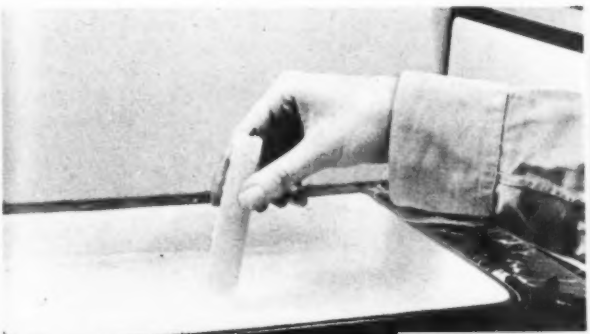


Right: You may not be able to get any heel irons from your shoe repair man, but steel thumbtacks driven in around the outer edge will serve as a good substitute.

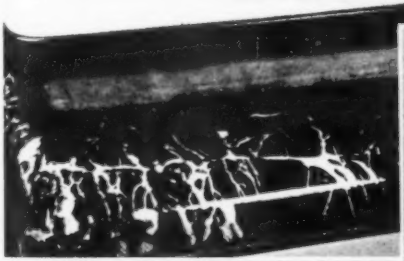
SHOE LEATHER



The right and wrong way to closet shoes. *Above*, neatly racked, shined and treed the shoes will retain their shape much longer than if thrown carelessly in a pile, *right*.

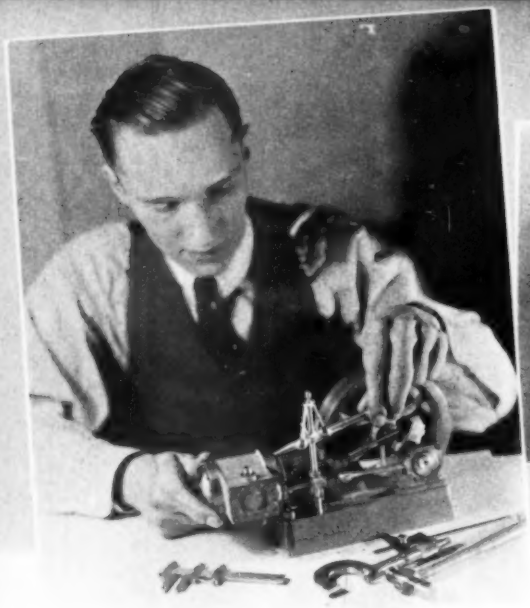


Here's an idea for waterproofing soles, seams and bottom part of uppers. This will protect your shoes against their worst enemy, water, if you're caught in a sudden shower without rubbers. First you heat a pan of said No. 1 enemy on the stove. A candle is then placed in the hot water and allowed to melt . . .



. . . whereupon it spreads over the surface, being lighter than the water. The shoes are then carefully dipped, one at a time, as at *right*. Wax clings to shoe and sinks into pores of leather and seams, rendering them water-repellent when dry.

MAKE YOUR



Left: A well finished, carefully machined model deserves the best in finishing touches. Custom-made cap screws are the answer. *Above:* Set of hollow mills for making them in various sizes.

by C. W. Woodson

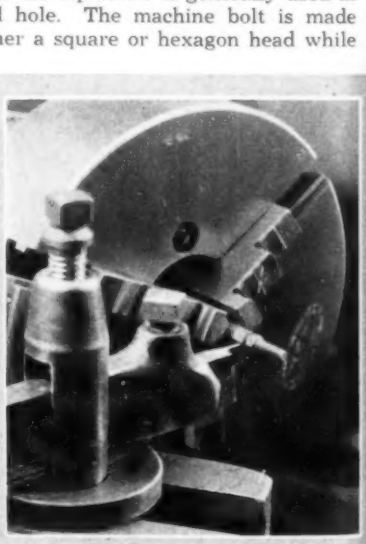
Small hexagonal cap screws are easy to make and will greatly improve your model's appearance.

EVERY designer and builder of scale model engines, locomotives and various other machines is well aware of the added value and exceptionally fine appearance small hexagon head cap screws lend to their finished models. With this in mind it is fitting that the mechanic who has spent much time and effort in building a model should also make his own cap screws to add this realistic finishing touch to his work.

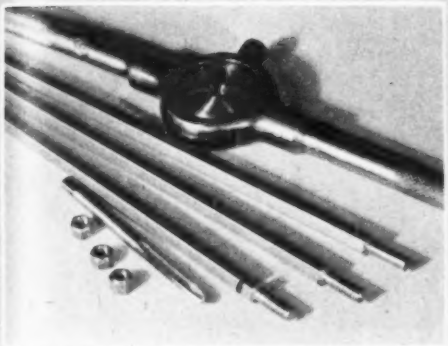
Cap screws are quite similar to machine bolts; the essential difference is in the superior finish of the cap screw, the shank being smoother and closer to tolerances, the head finished better and the thread cut to a finer fit. The cap screw is made with a washer face under the head while the machine bolt is not. The machine bolt is furnished with a nut while the cap screw is generally used in a tapped hole. The machine bolt is made with either a square or hexagon head while

Left: Second step in making the cap screw is threading the milled portion of the bar, leaving, of course, a shank.

Right: The parting tool separates the screw from the rest of the bar stock, and the process can be repeated for the next one. Chamfering top edges of cap and polishing complete job.



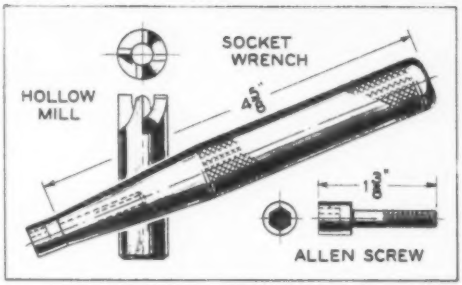
OWN CAP SCREWS



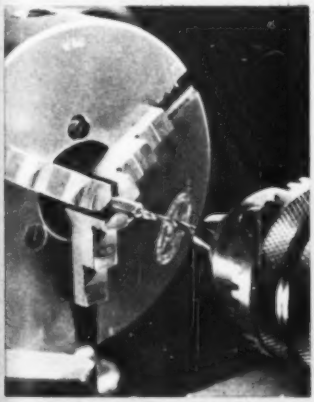
Above: Threading die, three steps in making cap screw, tap and finished nut made from same bar stock as cap screw. *Right:* First step is to chuck bar stock in three-jaw chuck of lathe and mill down to desired size with hollow cutter.

the cap screw is made in fillister heads, countersunk heads and various other styles in addition to the hexagon head with which we are most concerned here.

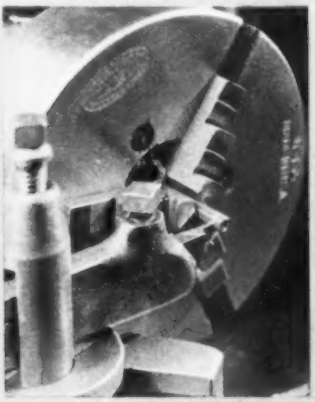
The best way for the model maker to turn out these small screws in limited quantities is from hexagon bar stock, which comes in both brass and steel in a variety of sizes, the smallest being $\frac{1}{16}$" in diameter which is the size to use for screws with 0-80 threads. The $\frac{3}{32}$" size is used for 1-72 screws while the $\frac{1}{8}$" size makes an ideal 2-56 screw. The $\frac{3}{16}$" size rod is well suited for 6-32 screws and the $\frac{1}{4}$" and $\frac{5}{16}$" sizes can be used to advantage on larger models. [*Continued on page* 144]



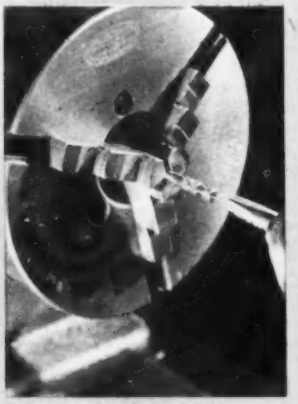
Allen set screw turned into end of homemade holder is excellent tool for cap screws. Hollow mill shown in background.



Making a nut. Rod is first held in chuck, drilled carefully at slow speed.



Cutting nut from stock with parting tool. This is easy operation.



Nuts are carefully threaded on tap held in chuck. Speed must be very slow.

Antique chess board and chessmen made by Arthur Garfield, of Pasadena, California.

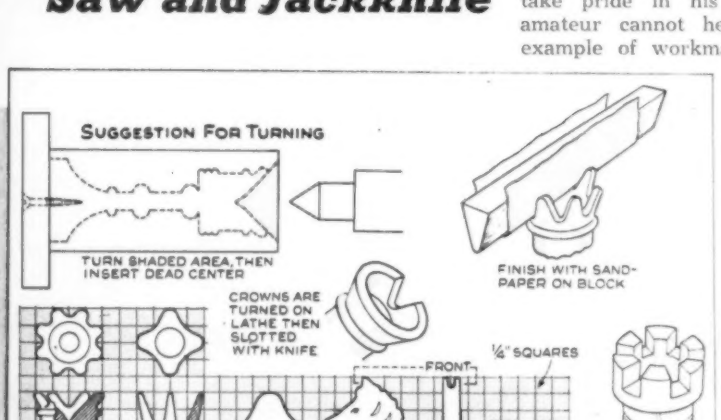
Detail work on features of faces, etc., may be done as shown with carving tools.

CHESS SET

Made with Lathe, Saw and Jackknife

CHESS has provided diversion and mental exercise for thousands in all walks of life for many centuries, and unlike most games of its age, continues in popularity even today. Just as the golfer takes pride in the excellence of his clubs as well as in his game, so does the ardent chess player take pride in his chessmen. Even the amateur cannot help but admire a fine example of workmanship in the set with which he plays and acquires skill.

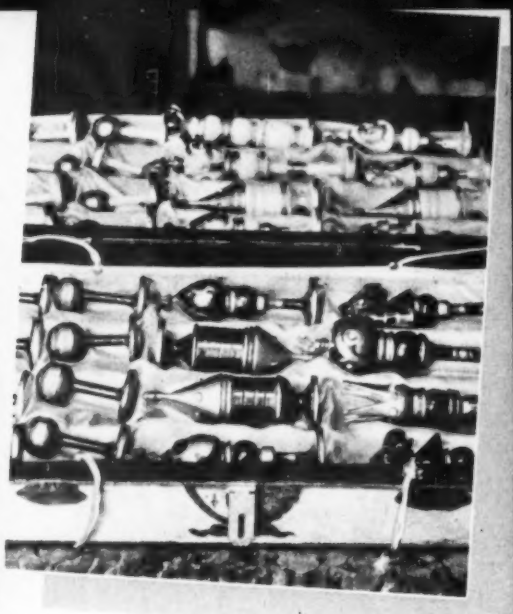
One drawback that has prevented many from owning as fine a set of chessmen as might be desirable is the price of a fine set. But this need no longer stand in the way of the player who also enjoys working with tools. Only the most inexpensive materials and the simplest of tools are required for the construction of this handsome array of chessmen and the



In simplest set, only small amount of carving is needed.

Right: Chess board folds into case for chessmen. Cloth with sheen like satin, or else velvet, makes luxurious case lining.

Special cutter on lathe eliminates jackknife work as shown below. If carving is done by hand, sharpen knife frequently on job.

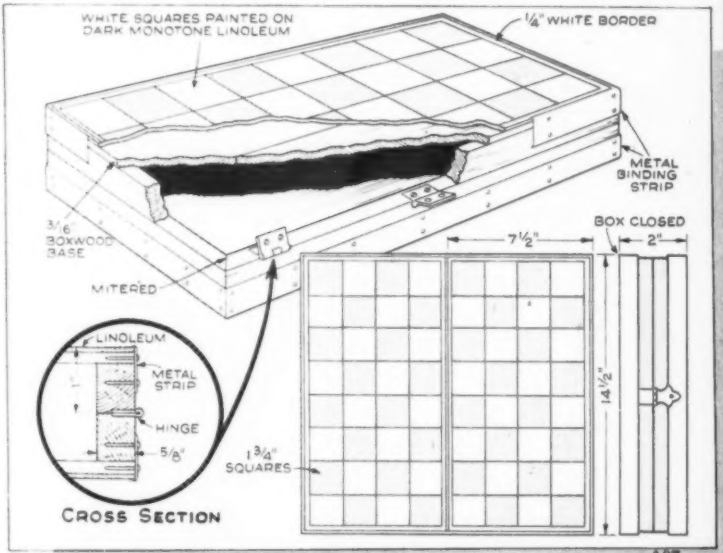


folding board in which they are kept. The only power tool required is a simple wood lathe.

While the wood recommended for the case is probably the most easily obtainable for the average person, it is by no means the only type which can be used. If enough high quality wood happens to be on hand, a still more beautiful job may be done.

As to the chessmen, the minute quantity of material necessary for their making can usually be found among mere scraps, permitting even the rarer woods to be employed. Naturally, if a natural finish is to be used, the wood should be selected for the fineness of its grain and the beauty of its texture.

Linoleum remnant and wood from a fruit crate, however, are used in the construction of this folding chess board as it is shown. The edges of the board are bound with standard metal strip. Remnants of linoleum, especially small pieces, are always available at house furnishing stores, and a dark monotone is recommended—or a smooth red or green or blue. White squares and a border are painted over this, and the entire piece cemented to the foundation of the $\frac{3}{16}$-in. box boards which in turn are nailed and glued to the $\frac{5}{8}$-in. sides. The metal strip is then installed, the curved edge holding down [*Continued on page 138*]



Old box wood and scraps of linoleum make case, as shown.

THE SCHOOL SHOP

Conducted by Gilbert Paust

Ground Instructor and Lieutenant, Civil Air Patrol

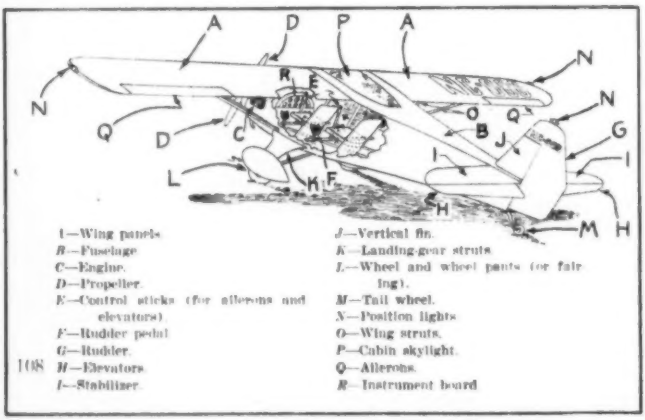
This is the plane in which we are taking our ride. It is a Piper Cub, a tandem job with pilot seat in the rear and passenger seat in front. Its remarkable stability and low landing speed make it ideal for instruction. Student uses dual set of controls. Swinging the prop is easy if done correctly.

HOW TO FLY

Lesson No. 4.

IN OUR previous lessons we learned about the various features of the modern plane and how they react with the airflow to give the ship its lift and maneuverability. This time we'll take a short hop in one of the popular light planes and see how simple it is to put the "sky pony" through its paces. You know that airport just outside of town where you've watched in envy the pilots flying around in their little ships and wished *you* had nerve enough to go up! Well, come on over and we'll rent a ship, and I'll take you "upstairs" and give you an idea what flying is like.

We have a choice of a variety of light planes for our jaunt. There's the Aeronca—like the one offered as first prize in the MECHANIX ILLUSTRATED "Buildwords" contest, the Taylorcraft, Porterfield or Piper Cub. We could choose



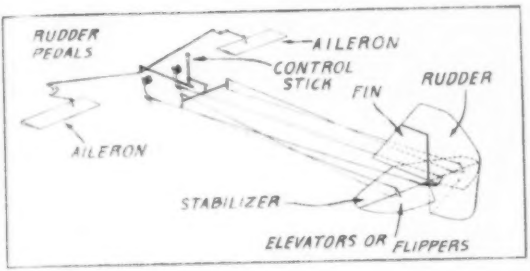
A—Wing panels.
B—Fuselage.
C—Engine.
D—Propeller.
E—Control sticks (for ailerons and elevators).
F—Rudder pedal.
G—Rudder.
H—Elevators.
I—Stabilizer.
J—Vertical fin.
K—Landing-gear struts.
L—Wheel and wheel pants (or fairing).
M—Tail wheel.
N—Position lights.
O—Wing struts.
P—Cabin skylight.
Q—Ailerons.
R—Instrument board.

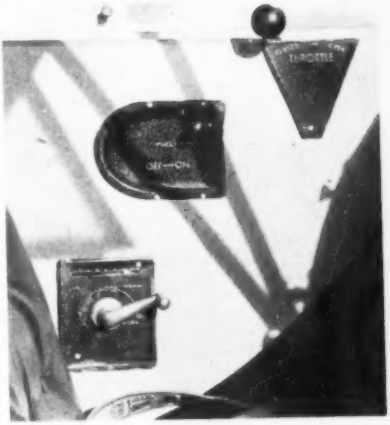
In this diagram is shown complete anatomy of the plane. Study the parts.

Mechanix Illustrated photos by Gilbert Paust

The rudder pedals of the plane are connected to the steerable tail wheel shown at *left* as well as the rudder. Before starting the engine, place chocks beneath the wheels as at *right* and have a competent operator at the plane's controls.

Below: Hookup of controls to control surfaces. *Lower right:* throttle, fuel lever, stabilizer control.

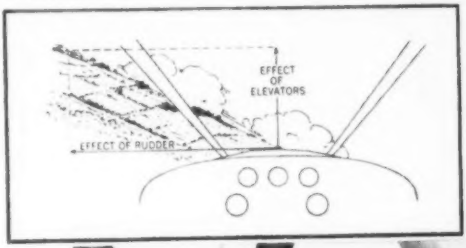




an Ercoupe or Skyfarer, but they're *too* easy to fly. This Piper Cub is a nice ship for our purpose. It has a minimum of instruments and is easy to handle.

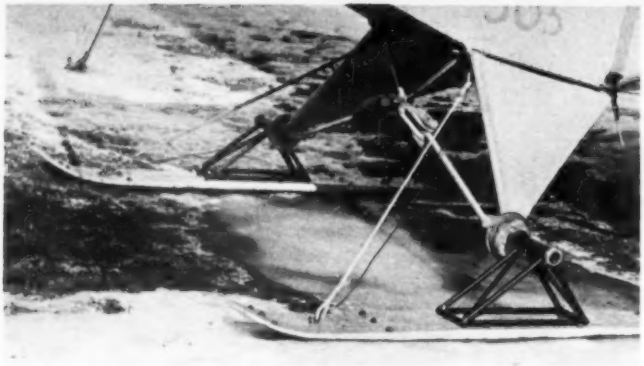
After making arrangements for rental of the plane, the first thing we must do is file an *Aircraft Clearance* in the Operations Office. This is a record the C.A.A. requires us to fill out so it will have complete information concerning the occupants of the plane and the time and distance of the trip. And you had better check that camera at the office, too. No more cameras in civilian planes for the duration, unless they're locked in the baggage compartment!

Below: The effects of the controls as seen from pilot's seat.



Now for the ship, itself. The mechanic has made the *line check*, so we don't have to worry about that. We'll study the line check in detail later on. There's one item we must be absolutely sure of, however, and that is the fuel supply. That metal cap on the cowl just in front of the windshield is the gas tank cap and the

This is the instrument panel of the Cub. *Left to right:* tachometer, oil pressure gauge, airspeed indicator, compass, temperature gauge and the compass card, altimeter and cabin heat.



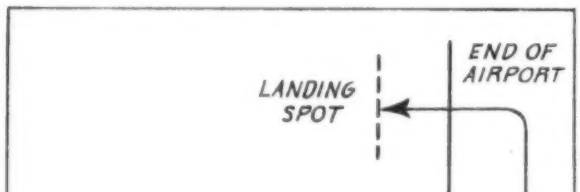
When winter comes you needn't store your plane till spring. Replace the wheels with skis and keep flying.

Every pilot must keep an eye on the old reliable windsock. Beginners take off and land *up wind*.

wire sticking up through a hole in its center is the gas gauge. The wire is attached to a cork float which rides on the surface of the fuel in the tank. When the tank is full, the float causes the wire to project quite a distance above the cap. We won't trust that gauge, however. We'll stick a clean rod in the tank to determine the gas level. Now climb in—you take the passenger's seat in front and I'll take the rear pilot's seat, and we'll have the mechanic swing the prop for us. Be sure to fasten your safety belt! It will hold you steady if we hit some rough air.

That double switch up over your head on the left is the ignition switch. It turns on the two engine magnetos. "Switch off," the mechanic says; so we'll check to make sure it's off and repeat "switch off." You'll find the throttle in *closed* position by your left hand. Open it just a fraction by pushing it forward slightly. Make sure the gas lever just below is turned *on*, also. The *carburetor heat control* on the right near the door must be turned *on*—it supplies heat to the engine carburetor from the exhaust and helps the warm-up. Now we'll put our heels on the wheel brakes to hold the plane when the engine starts. The mechanic has just called "contact" so we'll answer "contact" to tell him we're ready and *then* turn on the magneto switch. As he pulls the prop through the engine will catch and—there it goes.

While the engine is warming up, let's take a look at the instrument panel. The tachometer records the r.p.m. (revolutions per minute) of the engine. We'll crack the throttle so it will read 900 during the warm-up period. When the temperature gauge reads 100 degrees F. the engine will be warm enough for a take-off. [*Continued on page* 140]



Our landing approach is the 180 degree method. Time to turn depends on wind speed

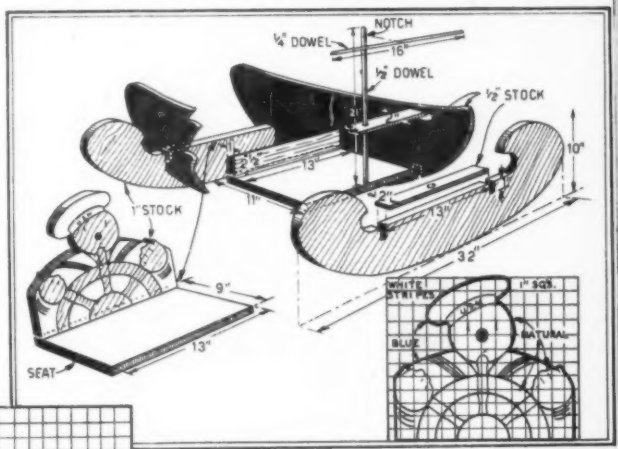
ROCKING BOAT for the Youngster

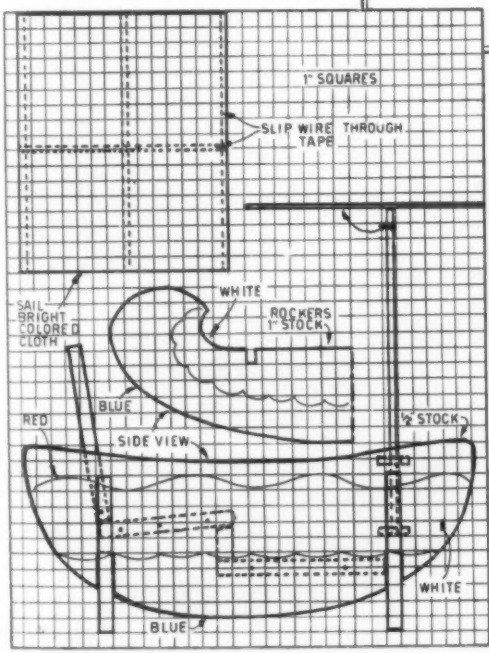
A SMALL boat for indoor play which rocks in a realistic manner can be made with hand tools by any ambitious father.

The two sides are cut from ½" stock and notches cut front and back; next, the two rockers are cut from 1" stock, notches sawed, and these notches slipped over the notches in the sides and nailed together securely. Two braces, 13"x2" having a ½" hole in the middle are cut from ½" stock and nailed in front between the sides. A 21" mast is cut from a ½" dowel, notched 1" from the top and a ¼" dowel 16" long fastened crosswise at this point. The mast is then set through the holes in the two front braces and glued in.

Cut the floor section, 11"x13" and the upright section which supports the seat, 2½"x13" from 1" stock [*Continued on page* 142]

Above: Fun galore for the young sailor in this playroom ship.





Above: Overall dimensions and assembly details. *Left:* Parts patterns in squares and suggested color scheme.

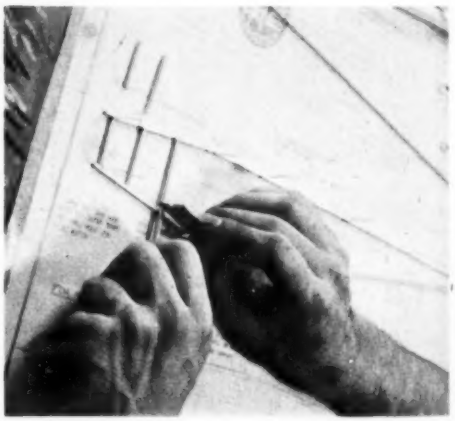
How To Make a Model Plane

First fasten waxed paper over plans with scotch tape as below.

Push straight pins through waxed paper into plans, to hold pieces in place for gluing. Board under plans holds pins.

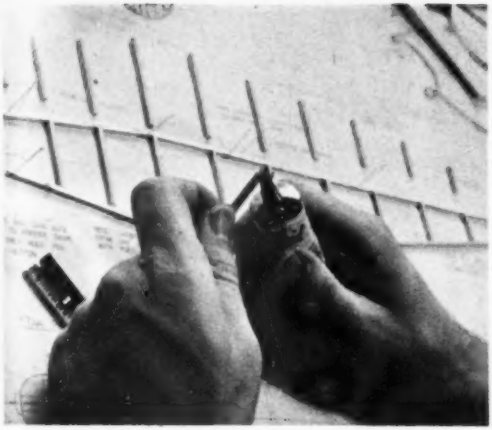
IF YOU'VE never built a model plane, but have longed to, these pages will show you how easy it is. And if you've built a few, maybe you'll get some helpful ideas.

In addition to the photos and step-by-step instruction, a few tips may be in order. Don't rush your construction job—and study the plans before you begin. Don't drench the parts with glue or cement. For the greatest strength, use two coats of cement—just as you do with paint. Put the first coat on and allow a few moments for it to soak into the wood.

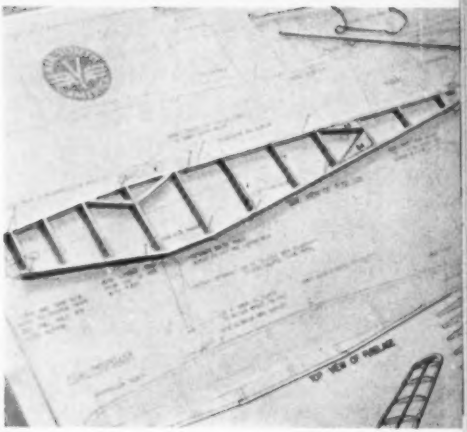


Lay cross pieces on plans and cut to fit with razor as above.

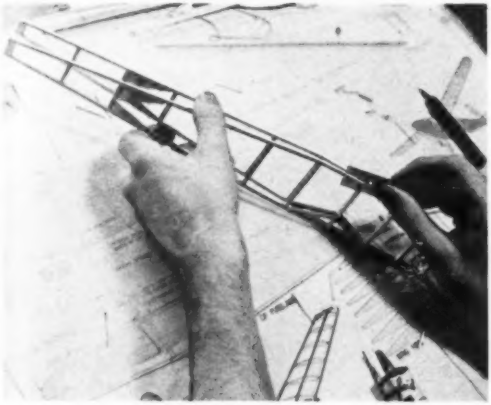
Photos taken exclusively for MECHANIX ILLUSTRATED by Harold Kulick.



Remove fitted cross pieces and coat ends with cement, then replace where indicated. Waxed paper prevents glue sticking to plans.

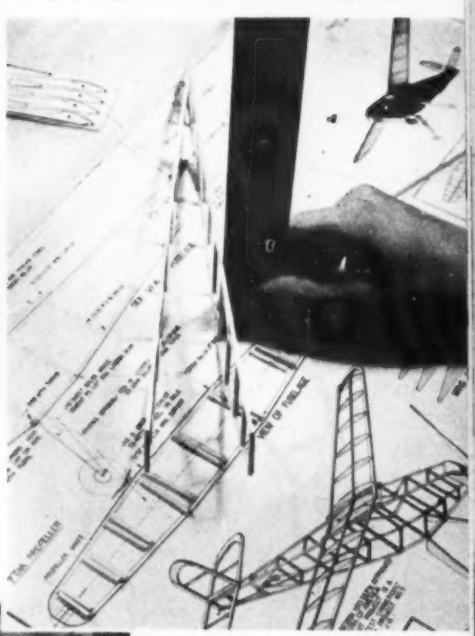


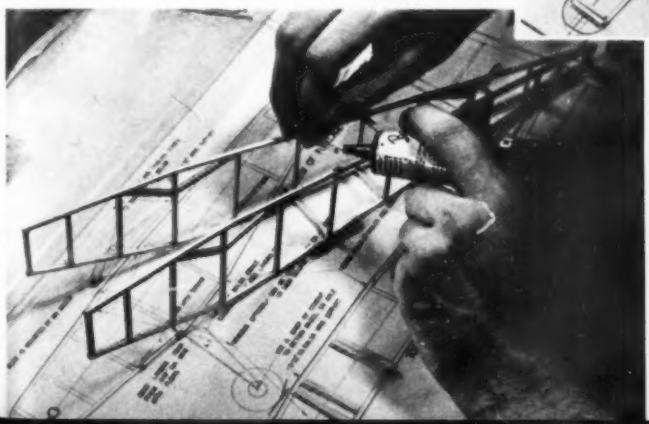
In fuselage construction, the two sides are made—one on top of the other on same plan then separated.



Remove completed halves (of fuselage) and separate with razor.

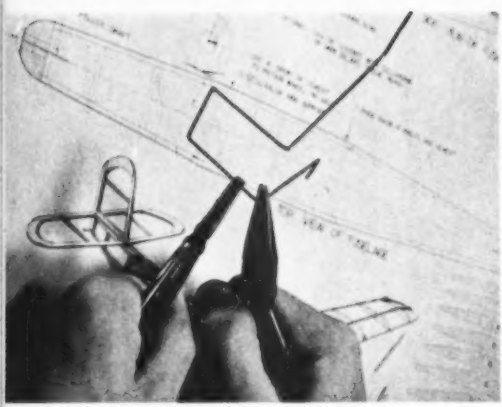
Then put the second coat on the surface to be joined, and put parts together. Take your time on the first few jobs. The more experience you get the faster you can work. Now try it.

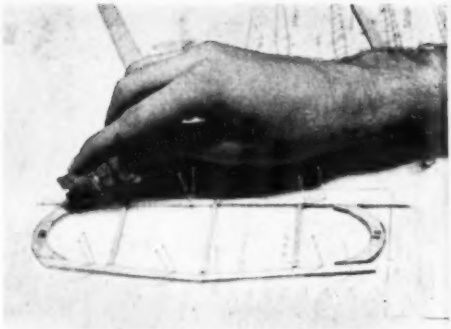




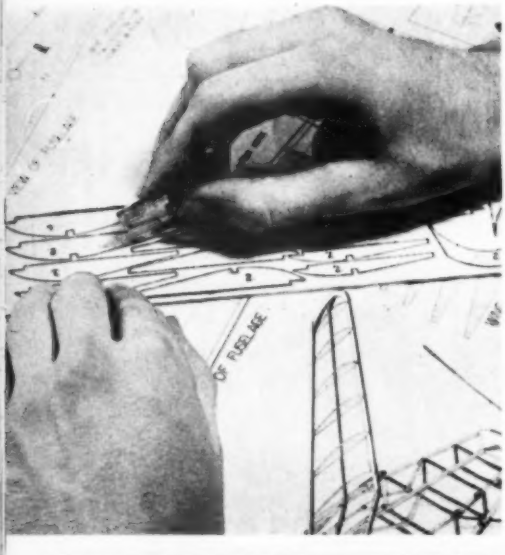
Fasten two sides of body together as *above*—at rudder post, and cut cross pieces for top and bottom of fuselage on plan. Note cross pieces which are cut and ready on plan.

Coat ends of top and bottom cross pieces with cement as at *left*, and insert them in their proper places as shown by dimensions on *top* and *bottom view* of the fuselage plan.

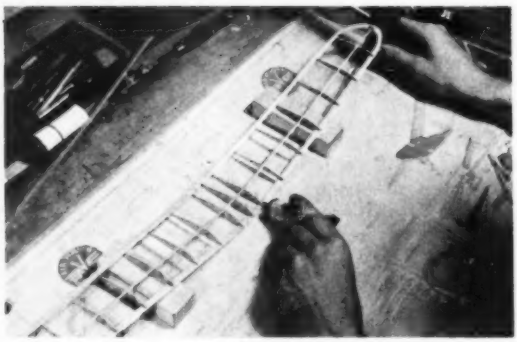


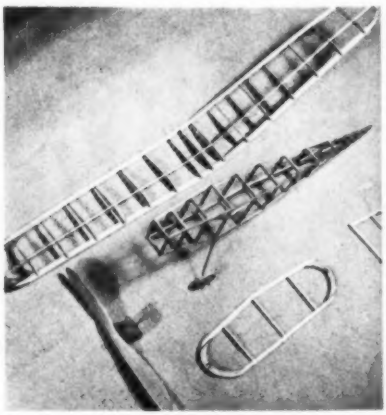


Shape wire parts with pliers *(left)* following dimensions on plan. Cut out tail with razor, and assemble on waxed paper and plan as with fuselage. Only one of these parts is made.

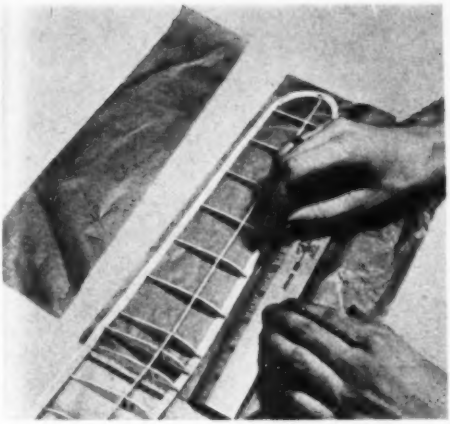


Cut out ribs as printed on balsa, with razor as at *left*. Use care to avoid splitting wood. Cut end pieces and notch all parts for spars, etc. Then assemble on the plan as before.

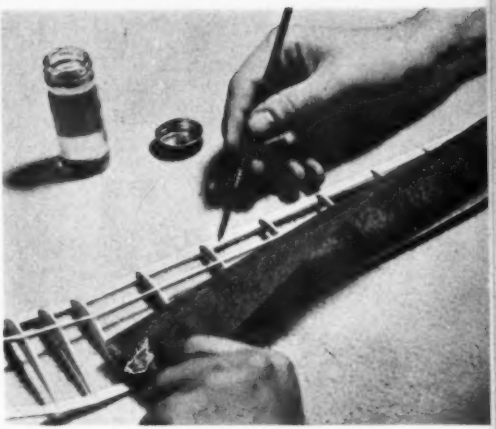




When glue is firm on both wings (left and right) block them up as above, to correct dihedral—measured with ruler at tips as shown. Plans tell right amount. Then cement together at center. This completes framework. *(Right)* See page 28 for prop carving.

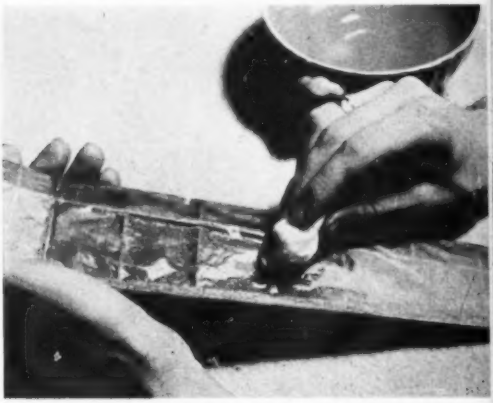


Lay wing frame on tissue and cut tissue to fit with razor.

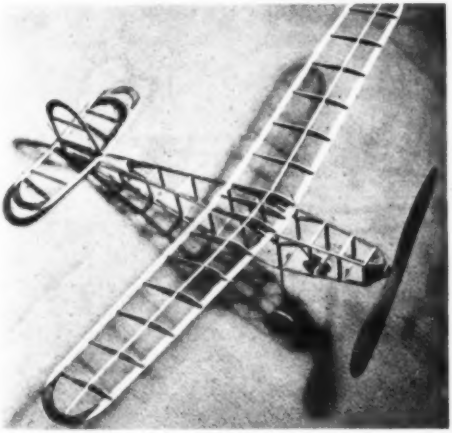


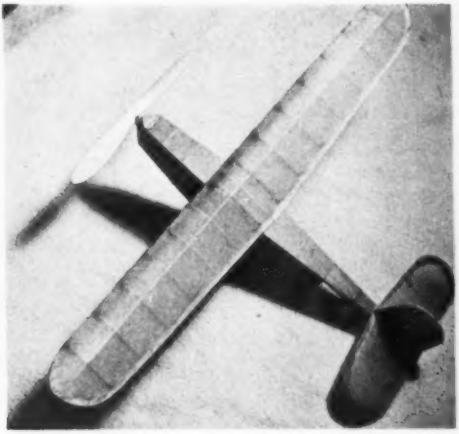
Fasten tissue to leading and trailing edges and tips with dope.

Covering wing's underside is easy when that side is flat. On top side draw paper tight from ends, then work out wrinkles *(above). Below:* Complete frame. Cover separately, reassemble.



To shrink the covering, wet it carefully with water, either with spray or soft cotton. It will shrink drum-tight when dry. If you've covered right your finished plane will look as *below.*





THE PACKARD

by Hi Sibley

Last month MI presented plans for a model of the original "Merry Oldsmobile," and here's the second of Hi Sibley's series on the cars that made today's cars possible. Hi, incidentally, has made quite a hobby of early automobiles, and is a qualified expert on practically all phases of them. His pioneer Packard, an interesting subject for the model maker, is nicely detailed and not too hard to construct.—The Editor.

1903 PACKARD

IN 1903 James Ward Packard, who gave the famous car its name, was an established horseless carriage manufacturer—he had been building them for four years! The original of his 1903 model had a special body designed for his personal use. Odd as it may appear now, it was open to the elements all around, and with its wind-swept "jump seat," it was very, very smart—for that period.

The motor was a single cylinder of about 12 horsepower with a ponderous fly-wheel, and its rumbling "ka-chunk, ka-chunk!"

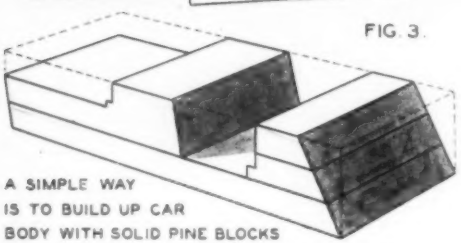
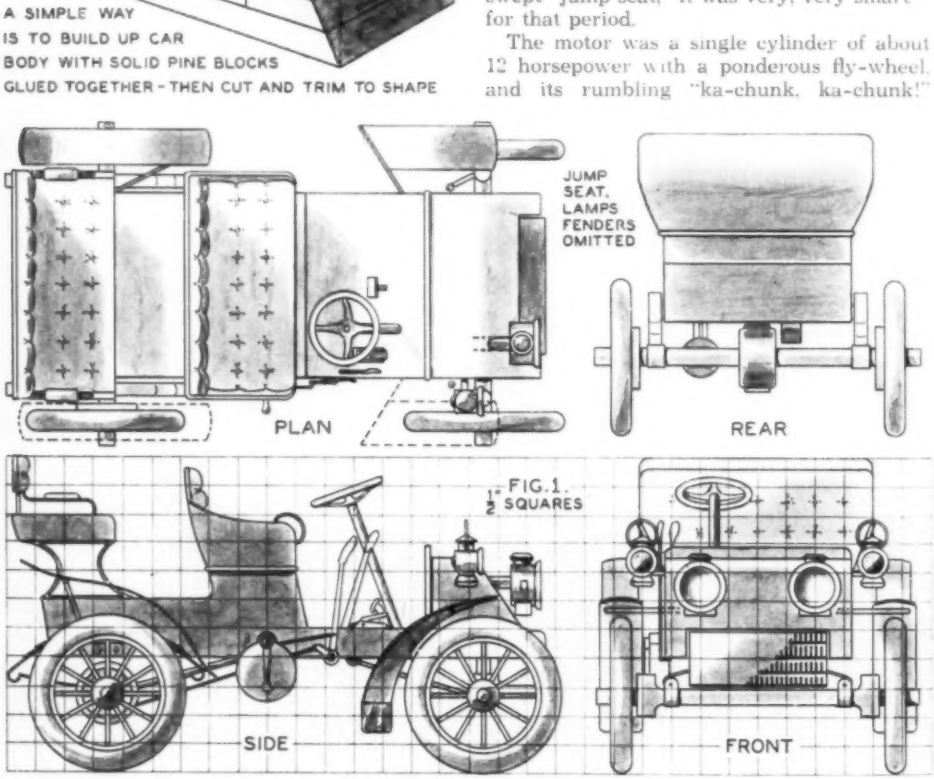
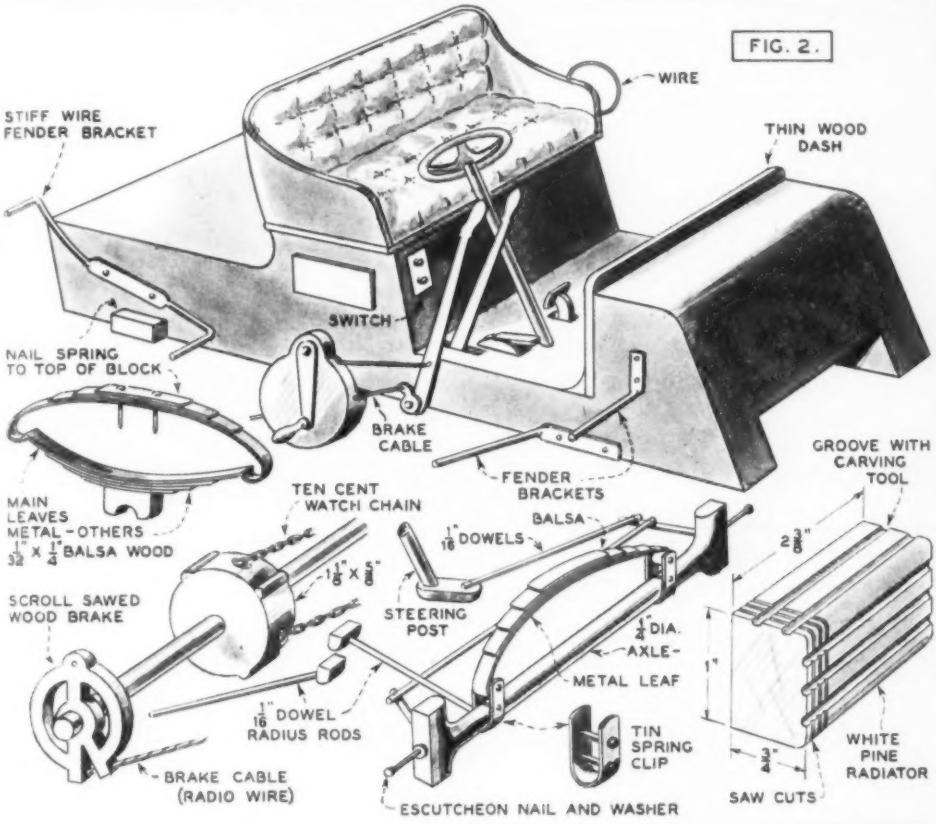


FIG. 3.

A SIMPLE WAY IS TO BUILD UP CAR BODY WITH SOLID PINE BLOCKS GLUED TOGETHER - THEN CUT AND TRIM TO SHAPE



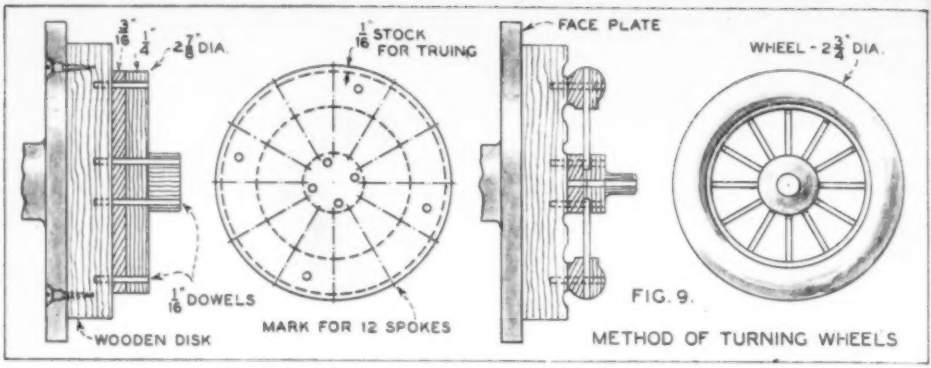
OF 1903—*A Realistic Model*

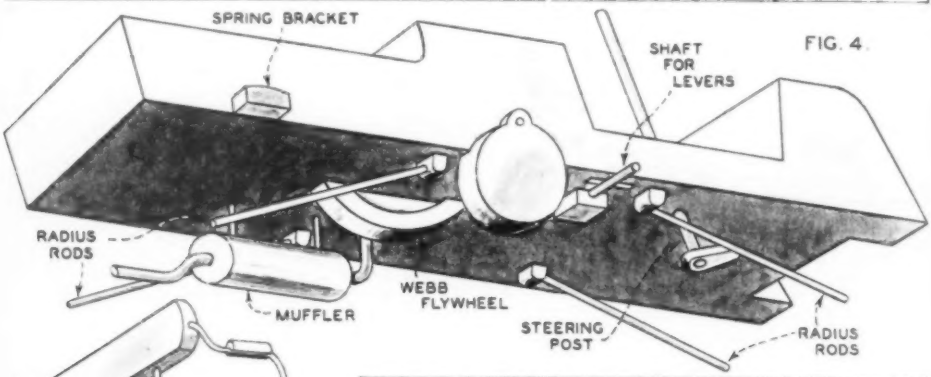


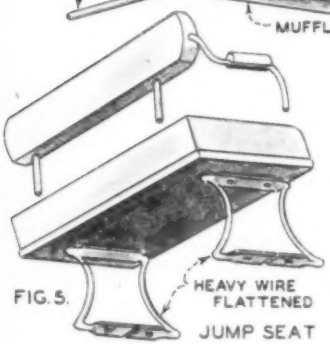
brought residents of Warren, Ohio, where it was built, running to the windows in admiration. With a probable top speed of less than forty miles an hour, windshields and enclosed bodies had not been developed.

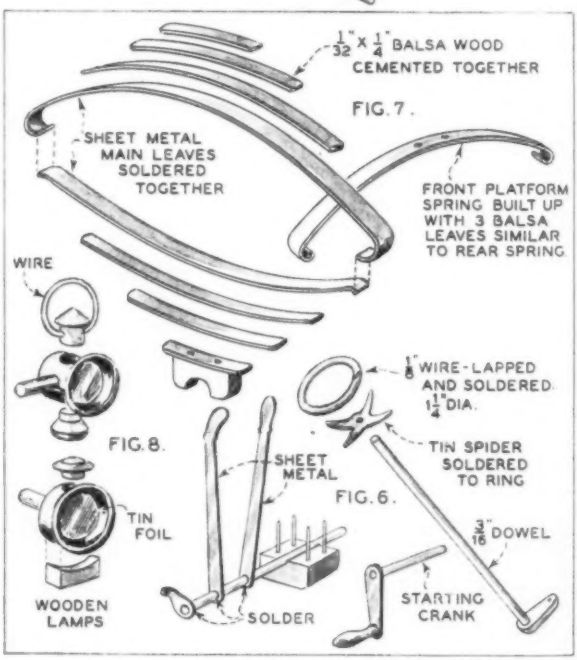
A model of this early Packard makes an interesting subject for your automotive collection, and it can be constructed as easily as the little Oldsmobile described in the April number. This is a larger vehicle, 9¾ inches long, 5½ inches high and the same width as the Olds. In mechanical principle it is

A one-cylinder Packard of forty years ago, before acetylene lights came into use. Note bulb horn in steering wheel and platform springs.





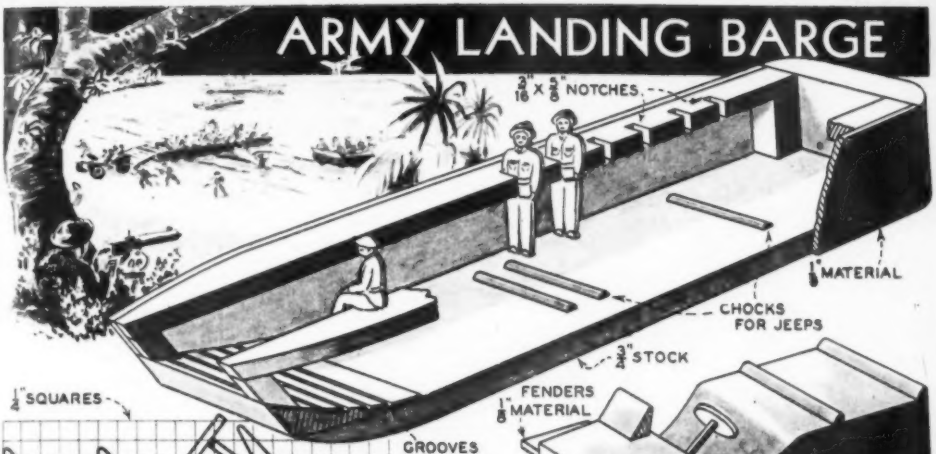


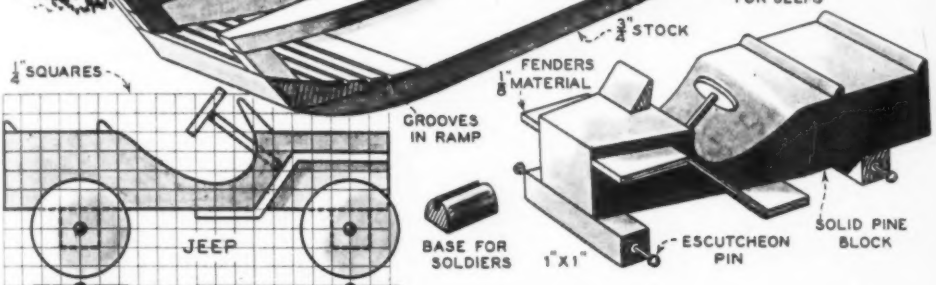


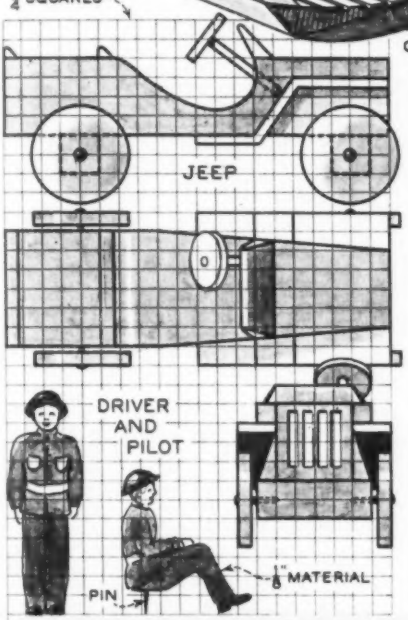
similar to the Olds, but has different type springs, an exposed radiator with fins, and a steering wheel instead of a tiller.

Assembly details are given in the drawings, which you will refer to as construction proceeds. For simplicity, make the body of built-up white pine blocks glued together as in Fig. 3 and sandpapered smooth so that the joints are not visible. Next install the flywheel, muffler and other parts which go on the underside, as detailed in Fig. 4. These [*Continued on page* 138]

ARMY LANDING BARGE



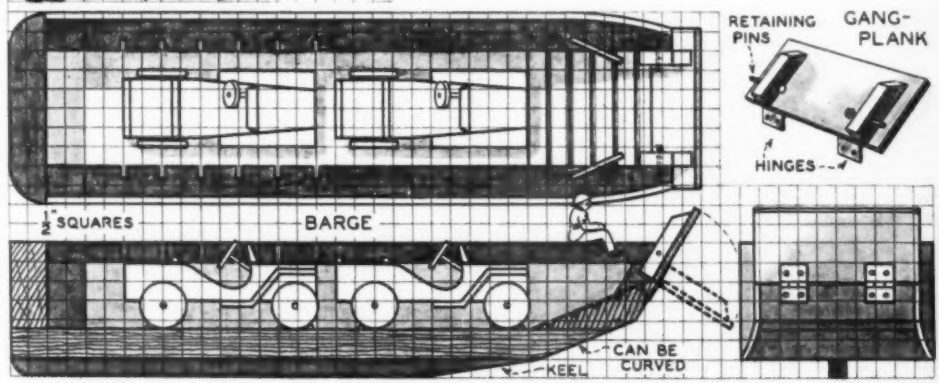




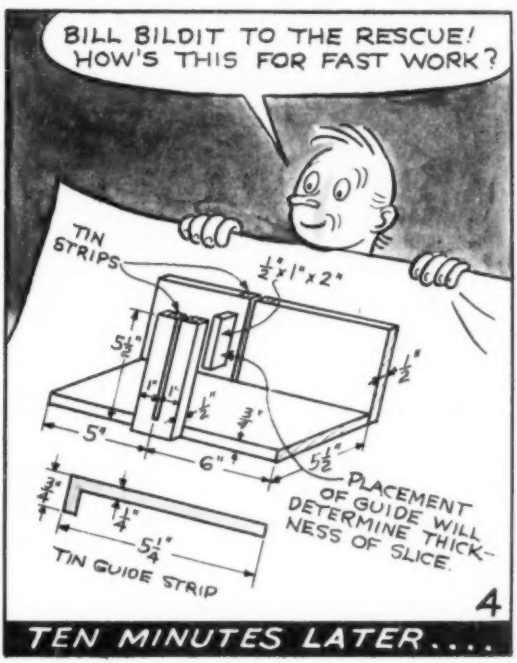
THIS little invasion craft will transport a dozen soldiers, two jeeps and drivers right up to the beach of enemy territory and not wet a foot. The forward end of the barge is hinged and when let down serves as a gangplank.

Odds and ends of wood can be used for bottom, transom, sheer strips and ramp, and selected pieces of berry crate for the sides and soldiers. The jeep bodies are solid blocks of white pine with scroll-sawed disks for wheels. All contacting surfaces of the barge should be given an application of marine glue; if that is not available in your community, use casein glue and see that all joints fit snugly. The hinges of the gangplank are well above the load water line. Sliding pins, simply nails with ends cut off, retain the gangplank in the closed position, and fixed chocks on the bottom of the barge prevent jeeps from rolling fore and aft. A slotted block serves as base for the infantrymen, who fit in

[*Continued on page* 144]



Bill Bildit Solves the Bread



Slicing Problem

Sliced bread is back on the market, but many housewives will still buy unsliced loaves; they will also find Bill's slicer useful for cold meats such as salami, bologna, etc.

FOUR L STRIPS FROM A TIN CAN PLACED IN THE SLOTS SHOULD KEEP THE KNIFE FROM HACKING OFF SPLINTERS THAT WOULDN'T BE VERY TASTY
6

SHELLAC ON THE OUTSIDE, RUB THE INSIDE WITH COOKING OIL. THEN A FEW SNAPPY DECALS WILL FINISH IT UP. JUST WAIT UNTIL THE LITTLE WOMAN SEES IT
7

MODERN HOUSES OF EARTH

Interior of adobe house above shows deep window seats and fireplace which is built around metal lining. Photo below shows exterior. Note tile roof and overhanging eaves.

by
Richard W. Haupt

Primitive adobe buildings have stood up for centuries. Your modern adobe brick home can be good enough to merit FHA financing! And it will cost less than a comparable dwelling of frame or other orthodox construction.

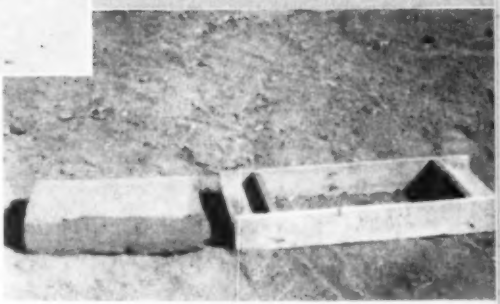
PART III

THE second major type of earth house construction is known as "adobe" (from the Spanish word, *adobar*, to plaster) and is based on the use of sun-dried clay or earthen bricks for the walls. Introduced into Spain from Africa in ancient times, adobe brick construction was brought the use of sun-dried clay or earthen dores. They taught the Indians, who had previously used adobe in crude form, how to build well and soundly with this material.

Though we may take issue with the motives and methods of the Spanish conquerors, we are indebted to them for this contribution to the architecture of the New World, and for the many beautiful missions, churches and other buildings resulting therefrom.

Ramming material in single test form. Tests for soil chemicals (to find out if soil is suitable for asphaltic emulsion stabilization) can be made by any chemical laboratory for small charge. Your State Agricultural Experimental Station may make this test for you free.

Left: Removing test form from finished brick. Mound in background is material for bricks. *Below:* Adobe brick test form and brick from it.



Bricks standing on edge to dry. Tank wagon contains asphaltic emulsion. Bricks must later be turned on their other edges.

Today, adobe brick buildings are found throughout the Southwest, California, Florida and practically all of Central and South America. Though best suited to warm, dry climates, there is no longer any reason why adobe construction cannot be extended further north and east. Asphaltic emulsion stabilizer or stucco sheathing renders the bricks impervious to wet weather, and summer sun in most northern states is more than adequate for baking the bricks. The chief obstacle remaining in the path of expanding the range of adobe houses is unfamiliarity of the general public with this construction method and its advantages.

Aside from cheapness of material (the Good Earth again), adobe brick houses have many of the same desirable qualities which characterize rammed earth buildings, outlined in the March and April issues of MI. Adobe houses are remarkably constant in inside temperature, due to the poor heat conductivity of the walls. They are cool in hot weather (one reason for their popularity in warm climates), and warm and dry in cold or damp weather. The bricks are easily molded by anyone, even a child, and since the walls are built up much like regular brick

Left: Mixing adobe brick material by hand in mortar box. Bricks in walls may be held together with more of the same material, or with regular mortar.

Below: If you can rent, borrow or steal a plaster mixer it will save considerable labor. Here the adobe mixture is being dumped for transference to wooden form.

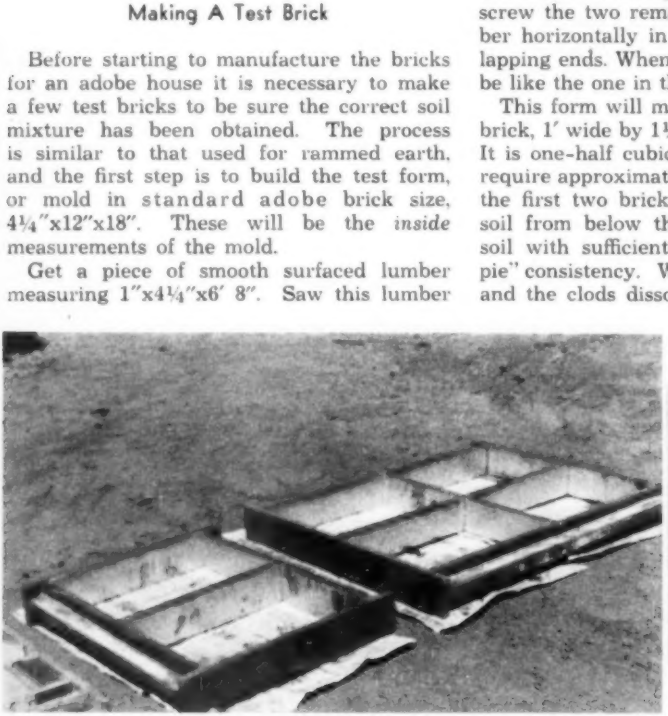
walls, far less "heavy" work is entailed in adobe construction than in rammed earth construction.

Making A Test Brick

Before starting to manufacture the bricks for an adobe house it is necessary to make a few test bricks to be sure the correct soil mixture has been obtained. The process is similar to that used for rammed earth, and the first step is to build the test form, or mold in standard adobe brick size, 4¼″x12″x18″. These will be the *inside* measurements of the mold.

Get a piece of smooth surfaced lumber measuring 1″x4¼″x6′ 8″. Saw this lumber into four 12″ lengths and two 28″ lengths. Screw the two 12″ pieces to the two 28″ pieces, at right angles, 5″ from each end. This will make a rectangular frame. For handles, screw the two remaining 12″ pieces of lumber horizontally in the centers of the overlapping ends. When finished, the form should be like the one in the photos.

This form will mold a standard size adobe brick, 1′ wide by 1½′ long by about 4″ thick. It is one-half cubic foot in volume and will require approximately 3¾ gallons of soil. For the first two bricks, take one cubic foot of soil from below the topsoil line. Mix this soil with sufficient water to make a "mud pie" consistency. When the soil is well mixed and the clods dissolved it is ready to mold.



After mixing adobe, forms are placed on clean newspapers on level ground. Odd-shaped form at *left* is for molding corner bricks.

Right: Sprinkling top of brick with water and smoothing down to seal pores. Stabilizer was previously added.

Below: Removing surplus material from a 4-brick mold with board straight-edge. Note drying bricks in background.

Spread newspapers on a level place on the ground. Wet the inside surface of the form, place it on the newspapers and fill with the mud mixture. Press the mud mixture well into the corners of the form and strike the top surface off level with a straight-edge board or trowel. Then a dash of water on the top of the mud, distributed evenly over the surface by your hands or trowel. Now remove the form immediately. If the mud mixture is the proper consistency, the form will lift easily and cleanly, and the brick will slump but slightly. Immediately clean any remaining particles of soil from the inside of the form with water, or the next brick will stick to the form. For the next test brick, add two handfuls of straw to the soil mixture before molding. Break the straw into 4" lengths and mix it with the remaining amount of prepared soil. Mold this brick as you did the other one. The bricks should be identified so proper comparison can be made when the tests are completed.

Three more test bricks should be made to see if it is necessary to add sand to the soil. For the first brick of this test, mix one part of sand to three parts of soil and enough water to make the mixture plastic, and mold in the usual way. For the second brick, use one part of sand to two parts of soil. For the third brick, use one part of sand to one part of soil. Be sure to mark the ingredients on the top of each of these bricks also, such as "1 to 3," "1 to 2," and "1 to 1." If the soil is

If mixture of adobe was correct, and form moistened on inside before filling, it will lift off cleanly, leaving shaped bricks standing on newspapers to dry.

Left: Mold making four bricks lifted clear, and the resulting bricks. They will sag very little if correctly mixed and will dry sufficient for turning over in about two days.

noticeably sandy it may not be necessary to make these three bricks. You should then test for clay. Add one part of clay or heavy clayish soil to three parts of your soil, for the first brick. For the second brick, use two parts of your soil to one part of clay or heavy clayish soil. For the third brick, use only one part of your own soil to one part of clay or the clayish soil. Appropriately label these bricks.

When all test bricks have dried in the sun for about two days, stand them on edge and remove the paper from the bottom. Leave them thus standing until the side that was on the bottom when molded is as dry as the other side.

Now examine the bricks for strength and for cracks. Small cracks in the center are not harmful, but bricks that have more than three cracks, $\frac{1}{8}$" or more wide and 3" or more long are too weak to use. The bricks that pass the crack tests should now be tested for strength. You can easily learn how strong a brick is from any testing laboratory for a nominal charge, or if you have access to a machine press you can perform your own tests. A good brick should test at least 350 lbs. per square inch in compression, 60 lbs. per square inch in tension and flexure and 40 lbs. per square inch in shear. When your bricks have been tested you will, of course, know which soil mixture is the best.

Don't use too much water in mixing the soil. An excessive proportion of water may cause the bricks to crack severely when drying. If the brick fails to retain its shape when the mold is lifted, it is an indication that the soil mixture contains too much water. Not enough water in the soil material will cause the mold to stick to the brick. The optimum moisture content by weight varies from 20% to 30% of the total weight of the soil material, depending on the characteristics of the soil used.

If the soil is suitable "as is" you are indeed fortunate. Even if the "as is" soil did not make the best brick it may be wise to use it, in order to save money, provided the

Stabilized adobe brick house under construction. Foundation is concrete and window frame of wood. Note "dovetailing" of corner bricks.

brick meets the minimum test requirements.

To find out how much asphaltic emulsion must be used to waterproof-stabilize the bricks, you must make three more bricks, using the soil or admixture that the foregoing tests proved most satisfactory. For the first brick, after the soil or soil admixture has been thoroughly mixed with water until plastic, mix in one quart of emulsified asphalt. Retain enough of this mixture, after molding the brick, to make a pat about 4" in diameter and ½" thick. For the next brick, mix the soil in the usual way and add 1¼ quarts of emulsified asphalt. Make a pat from this also.

For the third brick, add to the usual mixed soil material 1½ quarts of emulsified asphalt. Dry the bricks in the sun as you did with the others. The three pats can be dried speedily in a slow kitchen oven of 150° to 200° F. When the pats are dry put them in separate containers and cover with water for 24 hours. The pat that remains the hardest and that discolors the water the least will indicate the correct proportion of asphaltic emulsion to use in your soil material. Correctly asphaltic stabilized adobe bricks may be submerged in water for days with the moisture penetrating and softening of the brick confined only to a ⅛" surface layer and absorption of moisture of less than 5% by weight.

In adobe brick construction, the exterior walls generally should be not less than 12" thick for one story buildings; some building codes require them to be 18" thick. The interior walls are usually 12" thick.

The FHA requirements for adobe construction, prepared by the San Francisco insuring office, are given here, condensed. These requirements must be followed to secure FHA financing. Remember, FHA loans are obtainable *only* for approved adobe brick construction and not for rammed earth.

FHA Requirements For Adobe Brick Construction

1. General regulations for masonry walls apply to adobe brick walls, except when otherwise stated.

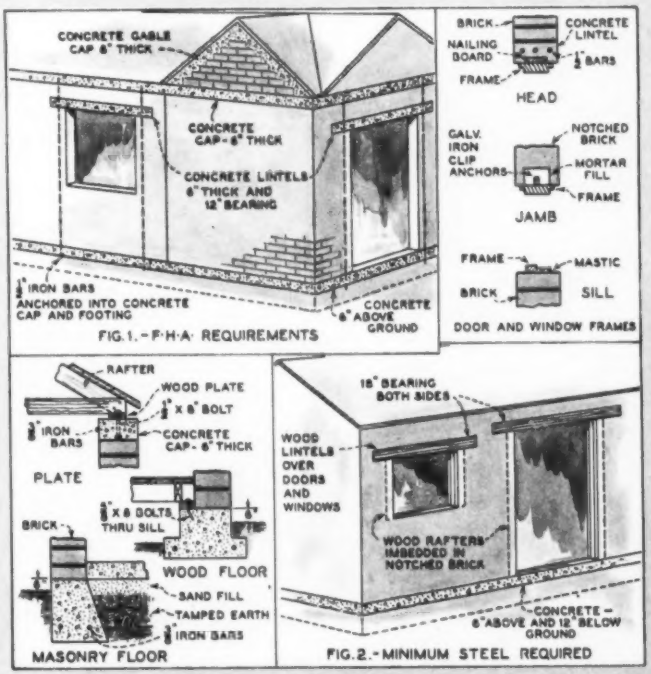
2. Adobe walls must be made of approved units conforming with detailed designs, under competent supervision.

3. Adobe brick in exterior walls must be made water resisting by mixing asphalt emulsion with the soil. Adobe bricks must be thoroughly cured before using.

4. Adobe brick samples taken from the job must be tested in compression and shear and for absorption, by an approved engineering laboratory.

5. Adobe bricks must have ultimate strength of at least 350 lbs. per square inch in compression and 40 lbs. per square inch in shear. Designed [*Continued on page* 142]

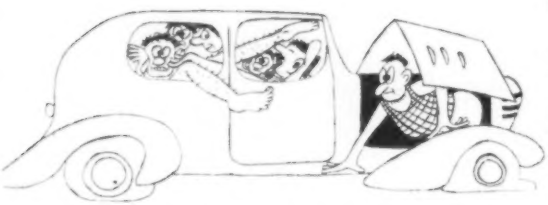
Sketch *below* shows construction details for adobe brick house. Fig. 1 meets all FHA requirements. Fig. 2 does not, but is less expensive, uses minimum of war materials.



The old bus may be off the road for the duration, but it will come in handy to announce your friends when and if your doorbell suffers a breakdown.

Illustrated by George Daniels

EMPTY CHASSIS IN THE OLD CORRAL

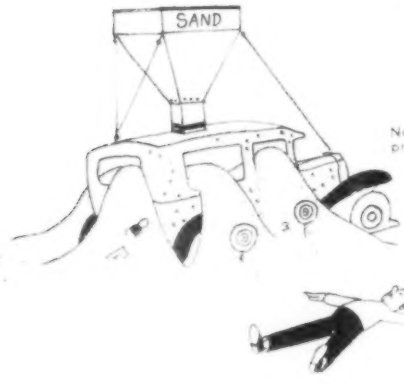


As a guest room; a bit crowded perhaps, but so are the hotels nowadays.

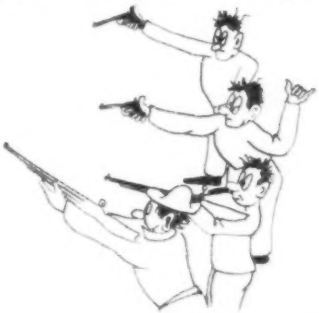
THERE isn't the slightest reason to let your car just sit around and rust, merely because you can't run it any more and have it blocked up somewhere.

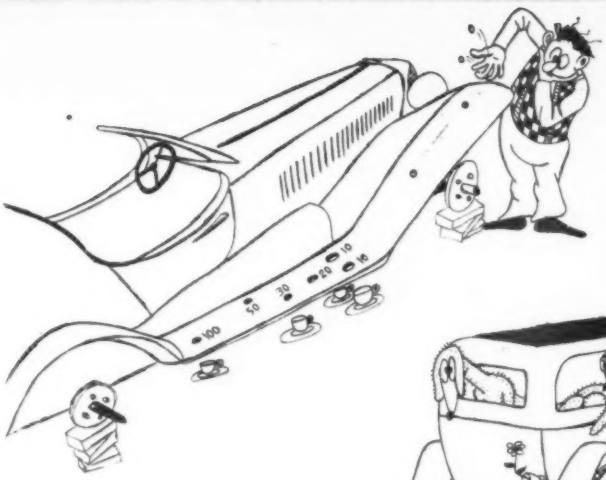
Many uses can be found for the hibernating jaloppy, and MI's aviation editor, George Daniels, wields his pen and gives you a few auto-suggestions. As you can see, George not only is a handy lad with the cartoons but also is possessed of a vivid tongue-in-cheek imagination. Incidentally, he bats out cartoons as easily as most people write, never "roughing in" the sketches first, and never erasing a line.

Hope his ideas will help solve your Driver's Dilemma.



No better backstop could be imagined for target practice. Cut a hole in top for the sand hopper.



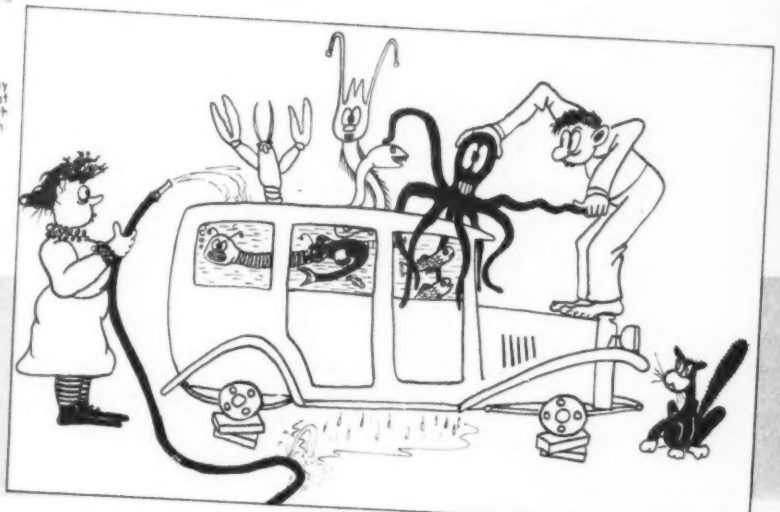


Inexpensive recreation: a marble game can easily be rigged on front fender and running board. If your car has no running boards use the side for handball.

Don't worry about the food shortage. Just raise chickens in your car. If you're sick of chicken try it with ducks or puffins.

Lack space for a Victory garden? The solution is simple like anything. Remove top, spark plugs and radiator cap. Open trunk. Fill all openings with good garden soil, plant seed and presto! You have garden.

Here's one for the Guppy fanciers. Caulk seams, cut out the top and fill with water. What an aquarium



Angle Bracket For Drill Press

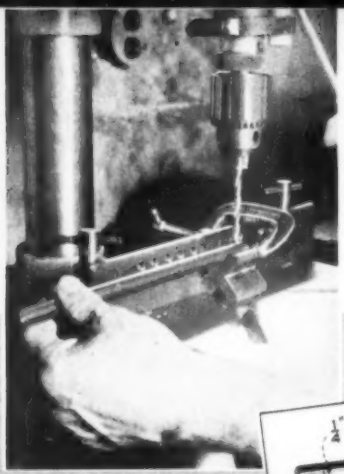
A VERY useful accessory can be made for your drill press from a short piece of angle iron.

The angle iron is cut to length, drilled, tapped and burred. It is then squared up either on the shaper or grinder, a ground finish being preferable.

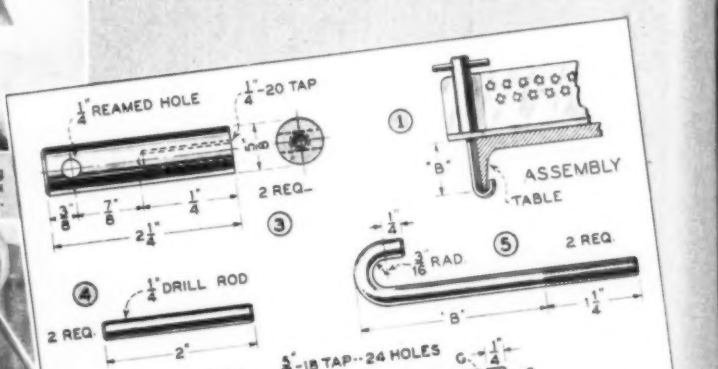
The care that is used in squaring up the angle will determine the accuracy that can be expected when the angle bracket is in use.

A few of the many uses of the angle bracket are as follows:

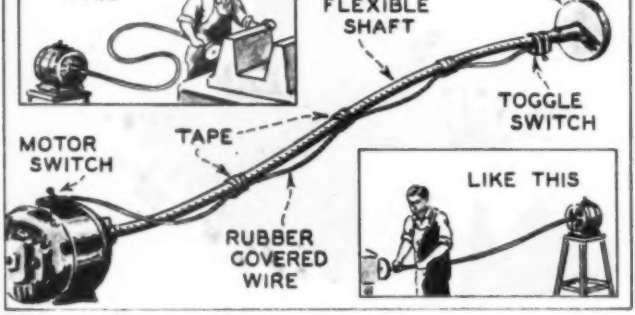
With the wide face of the angle bracket facing the drill press spindle, it can be used as an angle plate, the work being clamped in position, using two or more of the convenient tapped holes. [*Continued on page 144*]



Above: Drilling rod by clamping V-block against bracket. *Below:* As guide for milling board edges.



When Using A Flexible Shaft—Use Your Head!



I RECENTLY had to "call" a workman for using a flexible shaft tool as shown in left inset . . . with motor up close to work, and the shaft bent into a short double crook which could be expected to damage it seriously in a short time. In this day of hard-to-get equipment, this might easily mean a delay in production, *and a layoff for the workman.*

Right lower inset shows the correct method, which saves the shaft by keeping it in as nearly a straight line as possible. Cut in a "remote control switch" with switch conveniently located at "business end" of shaft.

You Can Fly My Helicopter

[*Continued from page 62*]

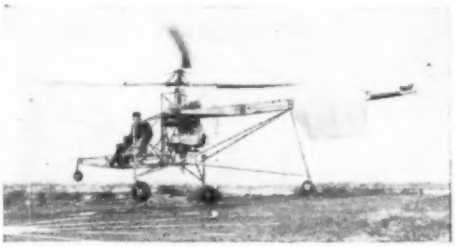
matter to glide toward a desired landing spot (which may be a very limited space) and then settle the short distance into it vertically.

With your engine running you can spend as much time as you need in landing, backing up or shifting sideways to park in a tight spot. Unlike conventional aircraft, in conditions of poor visibility the appearance of an obstruction ahead during a landing glide is little cause for alarm. You can bring your helicopter to a full stop in mid-air, then climb straight up, settle straight down, or move in any other direction you may care to—as slowly as you please.

If your ship is an amphibian, which may very likely be the case, you need not worry about lowering the wheels for a ground landing—or forgetting to retract them when descending on the water. The helicopter amphibian needs no wheels, and even today lands and takes off easily from either water or land even under heavy wind conditions that would seriously hamper a conventional ship of the same weight.

The helicopter will not replace the airplane as a means of long range high-speed transportation of heavy loads. A reasonable limit to the capacity of helicopters of the type now in operation would appear to be in the neighborhood of 12-15 passengers or their equivalent in freight. A logical top speed will probably be around 140-150 miles an hour, although this may not be attained for several years. Their utility, therefore, will be in the short run, the aircraft feeder line, the private flier, and any type of flying that must be done in and out of small areas. While the helicopter cannot equal the range and speed of the conventional airplane, it can provide safe and practical air transportation to and from places where no other type of aircraft could possibly operate.

The first two helicopter licenses have already been issued, and it is logical to assume that the ease of operation of the helicopter will make the requirements for this type of license much simpler than those for any previous type.



This little known helicopter was Sikorsky's first successful one. It had the same type of control system as that used on the present day machines. Pilots and engineers lacked experience, however, and tried numerous other control arrangements before returning to the original. Vertical fin on tail is absent on modern helicopter as side area of fuselage has similar effect.

As to the possibility of overly heavy helicopter traffic, it is only necessary to consider the comparative useable areas of the highways of the world and the sky overhead. The vast "Helicopter highways" offer not millions, but billions of times the useable space. The helicopter will not be confined to one narrow pathway, or even to one level, but will have millions upon millions of cubic miles at its disposal. Heavily populated areas or other traffic centers will naturally have some form of traffic control just as airports have today, but the helicopter flier need have no worry over a crowded sky.

Beginners will doubtless behave much like the new automobile driver—poking along the skyway at 15 or 20, but they won't get in your way because they'll be flying at their own altitude level. The speed demon, too, will fortunately be confined on his own particular level, where he won't be distracting your attention if you prefer to loll along and enjoy the view.

THIS IS A PREVIEW

In the picture at left you see Igor Sikorsky's helicopter's only rival—the Convertaplane, invented and developed by Gerard Herrick, instructor in the U. S. Army Air Corps during World War I and noted aeronautical engineer. Not only can the Convertaplane take off and land like a helicopter, but it can fly at 300 miles an hour, and can even be adapted for use as an automobile! For the latest news of this latest "Family Car of Tomorrow," read the exclusive article by Gerard Herrick in the June issue of MECHANIX ILLUSTRATED. DON'T MISS IT!

Remote Pedal Release

[*Continued from page 84*]

the base keeps the pedal in its normal, horizontal position when no foot pressure is applied to it.

Just back of the pillow-blocks (same distance as the length of the cable release push-button when extended) a block is fastened to the base. Across its top, is cut a semi-circular slot in which the cable-release rests. This is held firmly in position by a small metal plate pivoted with a screw at one end; the other end can be fastened down with a screw which enters a slot in plate.

Some experimenting was necessary to maintain the pedal at a resting height so it exerted no pressure on the cable release when at rest. I use a very long release cable to enable me to set the camera at least six feet back of the model.

To use the equipment, it is only necessary to do the focusing on a suitable model to take the place of the hands. Then remove it, set the shutter, and assume one's place at the set-up. When all is ready, press the foot down on the pedal. This opens the shutter, and when the foot is raised the pedal comes back and the release closes the shutter.

Home-Lamp Photo Lighting

[*Continued from page 88*]

Lens and shutter settings are suggested in Table II.

Many satisfactory pictures can also be made under existing home lighting. In fact, the simplest method of taking indoor pictures is to utilize the normal home lighting arrangement. The resulting lighting is often quite pleasing, as home lighting is generally arranged and balanced to give a soft, over-all illumination.

For brightly illuminated interiors such as kitchens and rooms with light-colored walls, expose 2 seconds at f/16. For interiors of average brightness, expose 10 seconds at f/16. For dimly illuminated interiors such as cellars and storage rooms, expose 3 minutes at f/16.

The Kodak Home Lighting Guide has been available through photographic dealers for some time. This is a dial-type Kodaguide (Figure 5) which enables you to calculate quickly and easily exposures for still or motion pictures under existing home lighting conditions. It is designed for use with Kodak Super-XX Film (equal in speed to Agfa Superpan Press; DuPont Superior 3), and indicates exposures for snapshots (practical for cameras with fast lenses), short time exposures for average use, and long time exposures for interiors taken with the lens stopped down for greater depth of field. Complete directions are given on the back of the guide.

The typical room scene shown in Figure 2 illustrates the application of the Kodak Home Lighting Guide. Guide settings would be: 400 watts; light shades; 5 to 8 feet. The exposure as indicated by the guide: ½ second at f/5.6.

"I bet you wouldn't believe me if I told you I was really a plumber by trade."

Summer Houses

[*Continued from page 96*]

is used entirely instead of two-by-fours. For sheathing, light bamboo sticks are bound to the rafters, about two inches apart, and thatch laid over this. Oat straw, broom straw or other suitable material that can be obtained locally is laid on the roof in about 16-in. lengths and held down by means of an anchor pole bound to the roof framing. Next, the lower edge of the thatch is clipped off even with hedge trimmers. The first row of thatch should of course be started at the eaves, and worked on up toward the peak. A cap is made of a section of large-diameter bamboo bound to the framing, as shown.

Pergola Summer House

The pergola style is usually more formal and can be made simple, or elaborate. The design in Fig. 3 is open on the front, with an extension terrace and a table on the middle post. This is built on a concrete floor, with posts secured to two anchor bars embedded in the concrete as shown. The posts are recessed so that the bars are flush with the wood surface, and thus rendered less conspicuous. Solid wood posts are the easiest to make, but hollow, box type with larger cross-section area are much more attractive, especially if surmounted with molding.

Roof structure consists of two-by-eight beams arranged as shown, and covered with battens spaced 12-in. apart on centers. Lattice on sides is of the same material, forming 10-in. by 12-in. rectangles (on centers). The table top is built up of 1-in. by 9-in. boards on cleats and supported by brackets beneath, as shown.

Your Invention Clinic

[Continued from page 12]

cigarette butt problem could be licked by much simpler methods. Perhaps you and other inventors can work upon the development of a suitable cigarette butt disposing device.

Protection Without a Patent?

George R. Bradley, Calgary, Alberta, Canada, asks if he would be protected sufficiently by describing a new invention, signing the document, having a notary or commissioner of oaths attest his signature; mailing the plans and specifications to himself in a registered letter to establish date of conception, and keeping the contents of the envelope intact until such time as it may become necessary to prove date of origin. Copies of the plans and specifications would then be sent to manufacturers.

ANSWER: *Anything which can serve as proof of the date of origin of an invention is helpful but it is not protection. You do not know if you even have an invention. Your papers may merely disclose an idea which someone else may have patented years before but with which you may be unfamiliar. Furthermore, no claims have been established for your invention; hence, you only have an idea. But ideas are salable. The method you outlined is recommended but it cannot substitute for a patent.*

Heart Beat Recorder

C. A. Rich, Indianapolis, Ind., submits the details for an electrical device which can be used to amplify the sounds of a heart beat, record it on phonograph discs and show the pattern of the beat on a cathode ray tube. He wants our opinion of the equipment.

ANSWER: *The mechanism is excellent as far as it goes but unfortunately it does not go far enough. The only thing you are doing is making a record of the sounds of a heart beat. The electro-cardiograph does not depend upon sounds. There is no microphone connection. Instead, feeble currents produced by the heart are recorded.*

If you can design simple equipment to do what the electro-cardiograph does, we feel sure that you will have a very worth-while invention. Perhaps vacuum tube amplifiers and a cathode ray tube could be arranged to perform in the same way. But it is not sufficient merely to show sound patterns.

Light Bulb—Thermos Bottle

Ted E. Orrack, Las Vegas, Nev., submits a plan for a plug-in type electric light bulb and also for a square thermos bottle.

ANSWER: *Except for the fact that your electric light bulb is not as well designed, it is similar to the bulbs found in England and used on automobiles in this country. Your light bulb will slip out of any socket very quickly particularly if the socket is submitted to vibration. Modern Bayonet sockets hold more securely.*

You did not explain the advantages of the square thermos bottle. We believe that its construction would be complicated and breakage would be high. Perhaps you have something in mind which was not made clear in your description. If so, you should send the information.

Green wood has 10% to 35% less heating value than dry wood.

The same quantity of industrial alcohol can be produced from 40 bushels of grain as from one ton of raw sugar.

It has been postulated that stars sweep up hydrogen and its compounds from inter-stellar space, thus obtaining terrific energy released when the hydrogen is changed to helium.

New Drafting Tool Scribes Tiny Circles

To draw circles too difficult to make with any ordinary compass, the newly invented tool pictured above can be used by metal workers or draftsmen. Adaptable for use with either pencil or ink, it can scribe circles as small as a few thousandths of an inch in radius, up to a radius of ⅝ of an inch. Steady turning of the lower screw makes possible also the drawing of spirals or ellipses.

Victory Gardens

[*Continued from page 93*]

outstanding examples of heavy yielders. The accompanying chart, Fig. 2, lists these preferred vegetables and their nutriment values. Unless you have a good-sized garden (⅓-acre or better) it is not advisable to attempt raising sweet corn, because the yield is comparatively small and corn rapidly exhausts the soil. Potatoes are best avoided, also. On the other hand, beets, carrots and onions are excellent small garden crops, and have the additional advantage of keeping well in storage.

When laying out your garden try to have the rows run the long way and plant the taller vegetables on the north or west side so they won't shade the lower ones. If the garden slopes, run the rows *along* the hill, not up and down the side. A suggested plan for a small garden is shown in Fig. 1.

An assortment of fancy tools is neither necessary, desirable nor patriotic—the steel is needed elsewhere. A spading fork, hoe and rake will take care of your garden, if wielded energetically; if you *must* have another tool, get a small two-pronged cultivator for weeding close to the plants.

Spading or plowing is the first task in preparing the ground; turn the soil to a depth of about 10 inches (the full depth of your spading fork is just right). If you can get some rotted manure, spread it on top and work it in. A bushel of manure for about 25 square feet is usually sufficient. Stones, sticks and other rough matter should be raked out as much as possible. Commercial fertilizer will be scarce this year, but a Victory garden grade has been approved by the Department of Agriculture and the WPB. This grade carries 3% nitrogen, 8% phosphoric acid and 7% potash. It is being sold by regular fertilizer dealers and other retail garden suppliers. Commercial fertilizer should be applied along the rows in furrows about 2 inches deep and 2 inches from the plants or seeds. *Do not* allow it to come in direct contact with the plant roots or seeds, for it will burn them. The fertilizer bag will have more explicit instructions printed on it.

With the ground prepared, you are ready for planting. Remember that seed is valuable now, so don't waste it. Buy only what you'll require, and sow carefully. Don't sow too thickly; this is a well-known amateur error that results in considerable waste. Beans and peas should be sown as the plants are to stand as they are never thinned in the rows. Carrots, collards and other vegetables having very tiny seeds are sown somewhat thicker, then thinned out when the seedlings have sprouted. Fig. 4 gives data regarding the amounts of seed required for various vegetables, depth to cover seed, etc.

Unless you own a cold frame or hot bed in which to start plants from seed you had better buy onions in sets and tomatoes in seedling form. Sturdy, healthy young plants can be purchased at reasonable cost, and save the gardener a tough part of the job. Incidentally, when setting out young tomato plants, wrap the stems for an inch or so above and below ground in tinfoil, or make small "collars" from old wire screening. This will foil the cutworms and spare you the sad sight of seeing your beautiful plants flop over like trees in a logging preserve, their stems severed by the sharp jaws of the worms. Planting time for various vegetables is indicated in Fig. 3, and will also be found on the backs of the seed envelopes.

Once your garden is well on its way you'll have nothing to do except water, cultivate (which simply means keeping the soil loose and workable), fight weeds, and fight various and sundry insects. The weeds are comparatively easy—frequent attacks with hoe or cultivator will keep them under control. Bugs are more difficult, and call for several methods of combat. Spraying is one way; it controls such things as aphids, mites, scale, fungus, etc. Bordeaux mixture is a good all-around spray (fungicide) and can be obtained at any garden supply dealer. Chemically, it consists of lime and copper sulphate, in the proportion of 4 lbs. of each to 50 gallons of water. Various sprays containing nicotine are also effective; they should be handled with care, however, as they are extremely poisonous.

The Japanese beetle presents an individual problem, and for the small gardener the pick-and-drown method is probably most effective. The Nip bugs are easy to catch late in the afternoon, when they begin to get sluggish. Make the rounds with a jar one-third full of kerosene and pop the pests into it. You'll have to do this several times a week while the bettles are holding sway or they'll make your plants look like bullet-riddled airplane wings.

Harvesting is something for which you won't need much instruction, though we hope you'll need help to carry it all away. One thing though: don't wait until the vegetables are too mature. Pick 'em young. They'll taste better, and in the case of varieties like bush beans, the plants will bear longer. Remember that the plant is trying to carry out its natural function of producing seed, and the longer you can frustrate it by picking, the longer it'll keep on trying by bearing.

An early issue of MECHANIX ILLUSTRATED will carry an article on preserving and dehydrating foods harvested from your Victory garden. Watch for it!

Forty cyclotrons (atom-smashing machines) are now in existence.

Beaver dams are built with such strength and precision that horses can cross some of them.

The pronghorn antelope is one of the swiftest of American animals—it has been paced with automobiles at 40 miles per hour.

Taking the Jeeps over the Jumps!

PRODIGIOUS jumpers that they are, our fighting Jeeps still can't jump broad rivers. So the Army's resourceful Engineers find still another job for their Evinrudes! Huge rubber rafts are bridged in tandem . . . Jeeps and troops are loaded aboard . . . husky Evinrudes sing their deep-throated song of power . . . and quickly the Jeeps are over another jump!

Giving a lift to the leaping Jeeps is but one of many wartime jobs which Evinrudes are performing today. For Evinrudes are *enlisted for the duration* . . . in the Army, the Navy, the Marine Corps. Great Evinrude "Fours" power swift assault craft and landing boats. Evinrudes help build bridges, ferry supplies, troops, equipment. Mountbatten's famed Commandos know their power, rugged reliability and trigger-quick starting ease.

All the experience gained in 33 years of building fine outboards is centered on our assignments to build Evinrudes for the armed services. Knowledge of some of the tasks these motors must perform is an ever-pressing incentive to build them finer . . . and still finer! *After Victory,* there will again be Evinrudes for all who love the water . . . sparkling new Evinrudes whose performance will ably reflect many advancements achieved in their fighting forebears!

EVINRUDE MOTORS, Milwaukee, Wisconsin

Evinrude Motors of Canada, Peterboro, Canada

EVINRUDE
OUTBOARD MOTORS

★ *Invest in America! Every War Bond you buy helps speed the day of Victory. Then, good fishing to you.*

New Furniture From Old

[*Continued from page* 101]

Double Duty Desk

The good-looking desk shown in the photos was made from a dilapidated piece of furniture known as a "vanity." The desk is a piece of double duty furniture. Simply by lifting off the top it can be converted into two small cabinets which can be used as night cabinets at a bedside, as telephone tables, or for any of the other many uses that small tables with drawers have.

When not in use as a desk the flat top can be slipped into a closet. The top is a ¾" board to which have been screwed cleats forming two frames that fit the tops of the tables.

The first two steps in converting the vanity into a double duty desk were to remove the shelf and saw out the center part of the back, as shown.

This done, it was necessary to supply each of the cabinets with a fourth leg, for the vanity had only six legs, four in front and two in back.

As will be seen in several of the photos, the veneer of the vanity was in bad condition. When veneered furniture is to be painted there are three ways that peeling and broken veneer can be repaired:

1. If the veneer is peeling near an edge, use a knife-blade to insert glue under the veneer. Let it dry with a weight on it.

2. If a piece of the veneer is missing cut the edges of the bare spot straight with a razor blade and glue in a patch of cardboard of suitable thickness. When the glue is dry shellac the cardboard and a little of the area around it and sand lightly with fine paper. If this is not done, there is danger that when the paint is applied the cardboard may not take it the way the wood does.

3. Remove the veneer entirely. It can be stripped off with a sharp chisel without gashing the under surface provided the work is done carefully. After the veneer is off, smooth the under surface with plane and sandpaper.

The paint on the double duty desk was applied in two coats, the first a flat white undercoat and the second a satin enamel. A white undercoat is a necessity whenever dark furniture is to be painted a light color. Before starting to paint it is well to go over the old piece with a rag moistened in turpentine, to remove grease, dust, lint, etc.

If several colors are needed an economical stunt is to buy as large a quantity of white enamel as is needed, and in addition, small tubes or jars of pigments in the desired colors. Mixing your own colors is fun and frees you from the limitations of the manufacturer's color card. The pigment is a paste and must be dissolved in turpentine before being mixed into the white.

Plant Stand

The attractive plant stand was made from an old Martha Washington sewing cabinet.

Most of the simple steps by which the conversion was effected would be equally applicable to the conversion of any little cabinet into a plant stand. Not every reader will have a Martha Washington to work on, but anyone wishing to make a practical, good-looking plant stand will have no trouble in finding a small cabinet with drawers from which to build it.

The first step is to remove the top of the cabinet and the lids of the wells. In furniture of this kind that is an easy operation because the top is usually held in place by screws easily accessible on the underside.

The support for the lower of the two small drawers was then sawn out, as the space occupied by the large drawer and the one immediately above it was converted into a compartment with doors. The two lids of the wells were cut down and set in the wells on small cleats screwed to their inner walls. The lids thus form the bottoms of boxes about 6" deep which hold earth for the plants. Holes were bored for drainage.

Through an aperture, a glass dish was placed on the original bottom of the well to catch drippings that come through the drainage hole when the plants are watered.

The top small drawer was fastened in place and it too is filled with earth for plants; no provision is made for drainage as in this drawer several varieties of cactus are grown and these require so little water that absorption and evaporation take care of the moisture. The drawer pulls (knobs) were removed and wooden plugs glued into the holes and sanded smooth.

The second small drawer was sawn in two in such a manner that its lower part became a shallow tray while its upper part became a frame. Thin strips of wood were nailed inside the frame and hinges were screwed to it. A piece of glass rests on the strips and is held in place by half-round molding fastened on with light screws. Hinged to the top of the cabinet, the glass and frame act as a cold frame to protect the cactus planted in the top drawer. When raised, the cold frame is supported in the open position by a light wooden prop screwed to its side.

The tray was nailed in place to form the floor of the compartment in which are kept a watering can, scissors for snipping off dead leaves, a small scratch-cultivator, a trowel, spare flower pots and whatever other small tools and equipment are required for the care of the plants.

The top of the sewing cabinet was cut to make two hinged doors for the compartment. Meeting edges of the doors were rabbeted to fit each other, and two of the knobs from the drawers screwed on as door knobs.

In normal times the three compartments or boxes that hold earth would be lined with zinc,

[*Continued on page* 144]

NEW "DELTA" Complete Home Workshop Library

1400 Photographs and Drawings

A practical, up-to-the-minute, modern workshop library containing over 1400 photographs and line drawings—covering every phase of operation and maintenance of every major workshop motor-driven tool—with hundreds of special operations explained—valuable shop hints, short cuts, and scores of time-saving tables. Tells how to obtain unusual results, how to solve shop kinks and problems and how to keep your tools and accessories up to top efficiency. Every operation "shop-tested" by practical craftsmen.

What you get in this Modern Workshop Library

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The Packard Of 1903

[*Continued from page 118*]

are all wood except the shaft which carries the transmission levers. This and the radius rods are fitted later for convenience.

The "jump" or "monkey seat," Fig. 5, is made of ⅛" pine or other material with a carved backrest supported on wire, as shown. The whole unit is secured to the rear deck of the body with wire brackets, portions of which have been flattened and drilled. If the wire is steel, heat it red hot to hammer flat. The front seat is simply made of ⅛" material, Fig. 2, with cushions of oil-cloth over cotton batting, as described in the Oldsmobile article, or hand carved from white pine. For the steering wheel, solder a tin spider to a wire ring and nail to the top of a $\frac{3}{16}$" dowel, Fig. 6. Hand levers are cut from sheet metal, soldered to the shaft and painted black. The starting crank is similarly made. None of these, however, are movable as that would involve extra construction and is not necessary for this type of model.

Springs consist of a main leaf with thin balsa auxiliary leaves cemented on with model airplane cement. The rear springs are full elliptic, Fig. 7, and the front a single platform spring secured to the axle with tin shackles (refer to Fig. 2). Lamps are all wood, with lathe-turned drums and other parts glued on, as illustrated. Tin foil or aluminum paint is applied to the "lens," Fig. 8.

A method of turning the wheels was given in the Oldsmobile article in the April number, and here is another, though similar, way to do the job, Fig. 9. Instead of gluing the two-piece disk to a block on the face plate, small dowels are used, to be cut with a thin-bladed knife after the spokes are inserted. Note that the stock to be turned consists of two disks with the grain at right angles—one of them $\frac{3}{16}$" thick, the other ¼", thus allowing $\frac{1}{16}$" stock for truing up. Bear in mind that the ¾" disk to which the work is secured should also be trued up first before doweling the wheel disk to it. These small dowels are located between the spoke holes. Drill the hubs for escutcheon-nail axles.

Referring back to Fig. 2, note the construction of the rear axle and brake assembly. The latter is fixed on the dowel axle and is merely a scroll-sawed dummy piece, with a cable of radio wire attached to it. The differential housing is merely a wooden drum with bosses for tie-bolts and a ten-cent watch chain, painted black, for the drive chain. The front axle is whittled from one piece of white pine, and has $\frac{1}{16}$" dowels for tie rods, etc. For the radiator, cut grooves in a white pine block, and then make saw-cuts at right angles and paint the unit black.

Paint with the same combination as the original —white body with red wheels and running gear, with black hand levers, steering post, foot brake, and starting crank. Bear in mind that this is *not* a working model; the only moving parts are the wheels. Nor is this an exact scale model. It is just an adaptation designed for easy construction.

Chess Set

[*Continued from page 107*]

the linoleum and making a neat finish. Small hinges should be recessed flush with the wood, as illustrated, and a latch secured to the open side.

Construction of the chess men is a lathe and jacknife project, all of them having identical turned bases, and varying amounts of hand carving. A suggestion for turning the king and queen is shown in the drawing. When the cup of the crown is turned the points are whittled with a knife. Note that the king has eight points, the queen four long ones. The bishop is entirely lathe-turned, with a cross recessed in the wood and painted a contrasting color. The horse head is largely a jackknife job, and the castle has some slotting work in the top. The pawn is simply lathe turned.

The complete set for each player consists of one each of king and queen, two each of bishops and knights and castles, and eight pawns. One set should be light colored, natural wood for instance, the other set darker wood or black-painted wood. A close-grained wood is of course desirable for the figures. Maple is especially satisfactory for the light colored men, and walnut for the dark set, since these could then be finished with shellac and wax or varnished.

The completed case, which consists of the closed board, should be lined with appropriate cloth. Some makers prefer a shiny cloth such as satin, while others have a taste for velvet. Either one may be used, the beauty of the finished job depending largely on the patience of the worker and the skill with which the cloth is applied.

If the figures are painted instead of being finished in the natural wood, it will be found that a good grade of glossy enamel or a satiny lacquer will produce the most artistic results. The bottom surfaces of all figures should be carefully sanded before the finish is applied, regardless of the type of finish. This is doubly important, as it not only affects the appearance of the pieces, but also their utility, as they must stand firmly on the board.

The board itself may be given a coat of transparent lacquer or varnish after the white squares have dried thoroughly. If this is done, it is wise to follow the procedure after drying, with a coat of wax, rubbed to a high finish.

The checkering job, itself, must be done carefully to achieve the most attractive and workmanlike appearance, as haste may very likely produce a board with squares overlapping slightly at the corners. The best way to avoid this effect consists of using several thin coats of paint, allowing each one to dry before the other is applied. Heavier coats, even though they run over the penciled lines ever so slightly, may be the cause of a slipshod appearance.

Six persons condemned to death were pardoned by Britain's George I in return for submission to inoculation with smallpox. The experiment was successful.

$1,000 FOR YOUR IDEAS In the Big Marlin Gun Contest!

Now here's a chance for you hunters and target shooting fans, to *cash in* on your knowledge of guns! Marlin—always on the lookout for new ideas to improve sporting firearms—wants to hear from you. Sportsmen and gun dealers are cordially invited to join Marlin's big Gun Contest—with $1,000 in cash prizes to shoot at. And remember, many a good idea is simple and easy to describe. Your chance is as good as the next fellow's to win a prize. It's easy to get in the contest—read the details below and send your entry in today! Contest ends July 1, 1943.

Jot down your ideas for improving any current model Marlin Gun. Follow the simple contest rules and send your entry in. If you wish, you may suggest new features, not at present in the line. A free catalog is yours for the asking, to review the features of Marlin Guns.

PRIZES IN THE BIG MARLIN CONTEST

The first prize is $500.00 in cash; second prize $100; third prize $50.00; fourteen additional prizes of $25.00 cash each. Seventeen prizes in all! (Marlin suggests the purchase of U.S. Savings Bonds with the prize money.)

JUDGING

Three famous gun editors—Bob Nichols of Field & Stream, Jack O'Connor of Outdoor Life, Maj. Chas. Askins of Sports Afield—will select the winning entries. All ideas for which prizes are given become the property of The Marlin Firearms Company and none will be returned. Prizes awarded for the seventeen ideas which are most valuable and practical, in the opinion of the judges. Duplicate prizes awarded in the event of a tie. WINNERS will be determined and prizes announced as soon as possible.

CONTEST RULES

The Marlin Gun Contest is open to all sportsmen and dealers in guns, with the exception of Marlin employees. Written suggestions must not exceed 300 words, the shorter the better. No limit to number of entries which may be submitted. Write name and address clearly on each suggestion. Mail entries to Dept. B, The Marlin Firearms Co., 17 E. 42nd St., New York City.

Entries must be received on or before July 1, 1943.

Win cash with your ideas! Enter the Marlin Contest today.

The Marlin Firearms plant is now 100% on war production.

Marlin's Over & Under Shotgun, in 12, 16 and 20 gauges and .410 bore, is hammerless, cocks on opening, has sturdy one-piece frame.

All Marlin rifles—lever action, clip and tubular magazine and .22 automatic, feature deep-cut, accurate, "Ballard" rifling.

Marlin lever action rifles, in calibers .22, .30-.30 and .32 spec., have the solid-top, case-hardened receiver, with safe side ejection.

[*Continued from page 110*]

The oil pressure gauge shows us that the oil is being supplied to the engine at the proper pressure to lubricate it and cool it internally. In the air the altimeter will tell us our altitude above the field (altimeters give altitude above sea level, but are adjusted to read zero at field level) and the airspeed indicator the approximate speed of the plane through the air. Now we're all set, so we'll pull out the carburetor heat to turn it off and taxi to the end of the runway.

The windsock over the administration building indicates a west wind so we'll use the east-west runway, taking off into the wind toward the west. While taxiing downwind to the takeoff spot, hold the stick forward slightly to drop the elevators so the wind won't get under them and lift us over on our nose. Steer the plane with the rudder pedals—they're attached to a steerable tail wheel as well as the rudder, and use just enough throttle to keep the plane moving. Use the brakes if you have to stop.

Before we turn into the wind on the end of the runway, let's check on the magnetos—feet on the brakes, stick back and throttle forward until the tach reads 1,500. Now, with the double switch we'll turn the two magnetos on and off separately, so the engine will run first on one mag and then on the other. The tach doesn't drop more than 50 when we're running on either single mag instead of both, so we're O. K. Throttle back again.

There is no plane landing—if there were it would have the right of way, so we'll swing around into the wind. All set? Adjust the stabilizer control on the left for takeoff, control stick in neutral and open the throttle—slowly at first and then all the way as the ship starts to roll. Keep one hand on the throttle until we clear the field! And hold the plane on a straight course with the rudder! Now we're traveling at about 40 m. p. h. so we'll exert a slight backward pressure on the stick and—we're off. At about 25 feet above the field drop the nose a trifle by moving the stick forward slightly and pick up flying speed. Watch the airspeed indicator! When it reaches 75 we can continue our climb. To climb, pull the stick back a little until the airspeed is about 60 and hold that speed and position of the nose. We're clear of the field so ease back the throttle until the pointer on the tach reaches the white line on the face of the instrument. That's our cruising r. p. m. —2,100 on this ship.

At 1,000 feet we level off—stick and rudder in neutral, and adjust the stabilizer for level flight. Our airspeed is 85. That is our *cruising speed*. Turns are simple! Let's try one to the left. Note the position of the nose on the horizon. Be sure to keep it there during the turn. Ready! Slight pressure on the left rudder pedal and the stick a little to the left of neutral at the same time. When the desired bank and rate of turn have been reached, center the stick and release pressure on the rudder. The ship will stay in the turn of its own accord. To straighten out—right rudder and right stick until the plane is level and then center controls. A right turn is made in a similar way.

Look down and see if you can find the airport. Since it's your first time up you'll have some difficulty spotting it. There it is just below the left wing tip. Notice how small the buildings and cars appear and you'll realize the job our Navy pilots have in locating a small submarine periscope sticking up from the surface of a rough sea. Now let's return to the field.

Landing is probably the most difficult part of flying. It requires a development of judgment which comes with experience. Here we start our approach! Reduce the throttle slightly and lower the nose until we're down to about 800 feet. We'll fly downwind at about 1,000 feet to the right of and parallel to our runway, checking the wind to make sure it hasn't changed direction, and just as we get opposite the center of the field we turn on the carburetor heat to keep the carburetor warm during the glide, adjust the stabilizer for landing, and pull back the throttle all the way. Hold the nose level until the airspeed drops to about 65 and then lower it to glide. Hold that speed until we get near the field. Keep your hand on the throttle during the glide and landing, and every 20 seconds give it the gun a bit to clear the engine. Below the field we make a left gliding turn, keeping the nose down, and when almost even with the runway we make another left turn into the wind and head for our landing spot. When to make these turns depends upon the wind velocity. If our judgment has been correct, we are losing just enough altitude during the glide to enable us to touch the airport at our chosen spot. Pull the nose up a bit to reduce our speed to 60 as we settle into the field. Pull the stick back gradually as we approach the ground and level off at 3 feet, and as the plane settles slowly, pull the stick all the way back to drop the tail. There we are—a perfect three-point landing. But we're not finished yet! Keep the plane straight with the rudder and the stick back until we stop rolling. Now taxi over to the parking line, and cut the switch and open the throttle simultaneously. This keeps the engine from backfiring. Don't forget to close the throttle again as soon as the prop stops.

Out we go, place the chocks under the wheels, return our Clearance sheet and our flight is completed. I've tried to give you an idea of the thrill of flying. It's one you won't forget for a long time, and it really is just about as easy as I have portrayed it for you. And flying is SAFE! In Lesson 5 we'll discuss the Civil Air Regulations established by the C.A.A., which make your flights just as safe, if not safer, than a trip in an automobile.

(In the June issue of MECHANIX ILLUSTRATED: Lesson 5—Safety of Modern Flying. Don't miss it. Questions on this lesson will be found on page 144.)

WATCH ★ ★ ★ ★ MIDWEST

AFTER THE WAR IS WON ★ ★ ★
FOR SENSATIONAL ADVANCEMENTS
AND FEATURES SUCH AS - - -

SUPER BAND—SPREAD TUNING*

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OUR ENTIRE PRODUCTION FACILITIES ARE NOW DEVOTED TO MANUFACTURING RADIO EQUIPMENT FOR OUR ARMED FORCES

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MIDWEST RADIO CORPORATION
DEPT. 10-B CINCINNATI, OHIO

Modern Houses Of Earth

[*Continued from page 127*]

working stresses must not exceed the following in pounds per square inch: compression, 35; shear, 4; tension, zero.

6. Adobe structures must not exceed two stories in height. Height of adobe walls must not exceed ten times their thickness and must not be less than the following thickness: Two story structure: exterior; top story, 18"; lower story, 24". Interior, top story, 12"; lower story, 18". One story structure: exterior, 18"; interior, 12".

7. Mortar for adobe walls may be similar in composition to the adobe brick. Time shall be allowed in laying up bricks for equal settling of walls and drying of mortar. Brick laying must be done in uniform stages throughout the structure.

8. Concrete footings for adobe walls must be specifically designed and proportioned with relation to actual bearing capacity of the soil at the site. Weight of walls must be assumed as 100 lbs. per cubic foot. Concrete footings shall be reinforced with not less than two $\frac{3}{8}$" round iron bars.

9. Foundation walls must be of concrete to a height of at least 6" above finished grade; and thick enough to provide full bearing for the adobe brick walls, plus at least a 3" bearing for first floor slab or wood sill, bolted 6' on center for joists.

10. Adobe brick walls must be securely bonded to concrete bearing surfaces and capped at each story height with concrete at least 6" thick. the full width of the wall, reinforced with at least two $\frac{3}{8}$" round iron bars embedded at least 3" in the concrete. Walls must be allowed to settle before concrete caps are placed.

11. Plates for fastening roof and ceiling construction to wall caps must be bolted to the concrete cap not more than 4' on centers with $\frac{1}{2}$" x 8" bolts.

12. Interior partitions of stud construction may be used if desired. They must if bearing partitions, be on continuous concrete foundations.

All stud partitions in contact with adobe walls must be anchored to them with not less than three perforated galvanized strap anchors with hooked ends, embedded in the adobe wall at least 10".

13. All timber and woodwork in contact with adobe construction or concrete below the first floor must be protected as required under Termite Prevention Regulations. All other wood construction and woodwork below the first floor may be brushed or spray treated as termite prevention.

14. All lintels exceeding a clear span of 4' must be of steel or reinforced concrete, and must have a bearing of at least 12" on each side of openings.

15. There must be no pipes or chases in walls, except for reinforcing steel, unless walls are thickened accordingly.

16. The total amount of openings in any wall for windows, doors, etc., should not exceed one-third of the length of the walls.

17. All wall openings for windows, doors, etc., shall be vertically reinforced by one $\frac{1}{2}$" round iron bar for each side of the opening. These bars are to be anchored in the concrete foundation and are to extend to the concrete cap on top of the walls where they are to be also securely anchored.

Constructing your house according to these specifications will assure an FHA loan and also a very sturdy house. The accompanying sketch explains these requirements.

If you do not want FHA financing, you can save money by disregarding some of their demands. Steel is expensive and is needed for the war effort. Wood can be safely used in its place without weakening the adobe structure. On many building sites, where the subgrade is secure, monolithic concrete can be used for footings and foundations without additional steel reinforcing being necessary. Lintels can be equipped with timbers 6" thick and the exact width of the adobe walls, with a bearing on each side of the wall opening of 18", instead of using reinforced concrete or steel. A 2" thick wooden plate nearly the same width as the adobe wall can be securely bolted at the top of all adobe walls as a means of anchoring the roof structure, instead of the reinforced concrete cap. Timbers can be safely used to reinforce vertically all openings in walls, instead of concrete and iron rods. This is the traditional method of adobe construction in the Southwest. Its durability has been proved by the many adobe buildings, a century and more old, standing in good condition. This method is approved by many municipal building departments, including the Department of Building and Safety of Los Angeles County. By studying the drawings you will learn how to build a substantial adobe brick house without using any valuable defense materials.

Consult your municipal building department before drawing plans for your adobe brick house. After the house plans have been made, it is simple to estimate the amount of soil necessary to mold the adobe bricks required.

This concludes the third article in the series on modern houses of earth construction. The fourth and final article will be found in the June issue of MECHANIX ILLUSTRATED, *and will tell how to build your house of adobe brick.*

Rocking Boat For Youngster

[*Continued from page 111*]

and secure them between the sides with long screws. The seat, 9"x13" 1" stock, is nailed over the rear rocker and the $2\frac{1}{2}$" upright brace and secured to the sides with screws. The back of the seat (the sailor) is traced to 1" stock, jigsawed out, and secured between the sides with long screws. The sail is cut from bright colored cloth, 14"x17"; tape is sewed on, and baling wire slipped through to give a billowy effect.

KNOWLEDGE
THAT HAS
ENDURED WITH THE
PYRAMIDS

A SECRET METHOD FOR THE MASTERY OF LIFE

WHENCE came the knowledge that built the Pyramids and the mighty Temples of the Pharaohs? Civilization began in the Nile Valley centuries ago. Where did its first builders acquire their astounding wisdom that started man on his upward climb? Beginning with naught they overcame nature's forces and gave the world its first sciences and arts. Did their knowledge come from a race now submerged beneath the sea, or were they touched with Infinite inspiration? From what concealed source came the wisdom that produced such characters as Amenhotep IV, Leonardo da Vinci, Isaac Newton, and a host of others?

Today it is known that they discovered and learned to interpret certain *Secret Methods* for the development of their inner power of mind. They learned to command the inner forces within their own beings, and to master life. This secret art of living has been preserved and handed down throughout the ages. Today it is extended to those who dare to use its profound principles to meet and solve the problems of life in these complex times.

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Founder of Egypt's
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Has life brought you that personal satisfaction, the sense of achievement and happiness that you desire? If not, it is your duty to yourself to learn about this rational method of applying natural laws for the mastery of life. To the thoughtful person it is obvious that everyone cannot be entrusted with an intimate knowledge of the mysteries of life, for everyone is not capable of properly using it. But if you are one of those possessed of a true desire to forge ahead and wish to make use of the subtle influences of life, the Rosicrucians (not a religious organization) will send you A Sealed Book of explanation without obligation. This Sealed Book tells how you, in the privacy of your own home, without interference with your personal affairs or manner of living, may receive these secret teachings. Not weird or strange practices, but a rational application of the basic laws of life. Use the coupon, and obtain your complimentary copy.

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The ROSICRUCIANS
SAN JOSE (AMORC) CALIFORNIA

Army Landing Barge

[*Continued from page* 119]

slots in the sheer strip while en route to the beach head.

The jeeps are made in the simplest manner possible, assembled with brads and casein glue. Steering wheel is a button mold with a dowel for steering post. The wheels turn on escutcheon pins, and will be greatly improved in performance if a short piece of tubing, such as is used in tobacco pipe-stems, is inserted for a bushing. Paint the entire craft olive drab and apply one or two coats of spar varnish. Soldiers' faces and hands should be flesh color.

Angle Bracket For Drill Press

[*Continued from page* 130]

For drilling large thin pieces of material, the bracket can be used as a clamp to hold the pieces securely in position on the drill press table.

When it is necessary to drill holes through the center of round pieces of material, the bracket can be set ½ of the diameter of the part to be drilled from the center of the drill press spindle. The work can be held by hand or clamped to the bracket for drilling. If it is desirable to use a V-block, the block can be clamped in the correct position against the angle bracket. (See photo.)

For routing slots or milling the edges of plywood or thin boards, the bracket is clamped in the correct position with the thin edge of the bracket facing the spindle. (Photo at left.)

When drilling large quantities of work, the angle bracket with a suitable stop attached to the bracket or drill press table can be used to locate each piece for drilling, it being necessary to lay out only one piece for setting the angle bracket and stop in the right position.

The home workshop enthusiast will find many other uses for the angle bracket on his drill press to suit his individual requirements.—*J. C. Magee.*

QUESTION BOX

Here are the questions on Aviation Lesson 4. If you can answer them correctly, you'll be one jump ahead of the other aviation students when you start your flight training. Answers will be found in the text in The School Shop section.

1. What is the first thing a pilot must do at the airport before he takes up a plane?
2. What is the safe method of measuring fuel in the tank of the plane?
3. Does the pilot call "switch off" before or after he checks the switches to make sure they're off?
4. Does the pilot call "contact" before or after he turns on the switches?
5. What is the purpose of the tachometer?
6. Does a plane take off into the wind or with the wind?
7. Which plane has the right of way—the one landing or the one taking off?
8. How are the magnetos checked before takeoff?
9. During flight, is the engine run always at top speed?
10. How does the pilot pick up speed after the plane has left the ground on takeoff?
11. How is a turn executed?
12. What is the procedure when cutting the switch after parking the plane?

New Furniture From Old

[*Continued from page* 136]

copper, or galvanized sheet iron with soldered seams. But because of metal scarcity their inner surfaces have been coated with asphaltum varnish, which is water repellent. Caulk all cracks and holes before applying the asphaltum and do not drill the drainage holes until it has dried.

Before painting the plant stand, sand lightly. If a light color is to be used, first apply an undercoat of flat white into which has been mixed a little of the enamel that is to be used as the final color. A mixture of eight parts undercoat to one of enamel is good. The enamel "fortifies" the undercoat so that it is harder when dry than it would have been without the admixture of the enamel. A final finish that is flat is inadvisable for the plant stand, as all flat finishes soil more easily than glossy ones. A final coat of hard-drying, lustrous enamel will be washable and will give better satisfaction.

Make Your Own Cap Screws

[*Continued from page* 105]

These small cap screws are best made in the lathe with the stock held in the three jaw chuck. A hollow mill, fed to it with the tailstock hand wheel, is used for quickly bringing the screw shank to size. It is then threaded with a small die and the screw cut off with a parting tool. Photo 1 shows a set of hollow mills for making screws from 0-80 on up to 10-32 in size while Photo 2 shows various steps in making a cap screw. Photo 3 is a close-up of the hexagon rod held in the three jaw chuck with the hollow mill supported by the tailstock after cutting the screw shank to size. In Photo 4, the shank is being threaded by hand with a die. These two operations could be speeded up by arranging the tools on a tailstock turret head where the quantity warrants it. Next, the screw is cut off with a parting tool held in the tool post of the lathe (Photo 5). Later the screw is rechucked in a collet, big end out, where a facing cut is taken across the head and the corners chamfered. Stops are set for these operations and the screws are quickly brought to a fine finish and all exactly alike.

Studs can be made up from round rod in much the same way screws are made and when nuts are to be used with the studs they are turned out of the same rod used for the cap screws by first drilling a deep hole as in Photo 6, cutting off with the parting tool (Photo 7), and finally threading as in Photo 8. Here the tap is held in the lathe chuck while a socket wrench is supported by the tailstock, a nut blank is inserted in the socket and the lathe turned over slowly while the nut is fed to the tap. Plenty of cutting oil is used as well as great care to avoid breaking the tap.

Serviceable socket wrenches, hardened for long wear, can be easily made in various sizes, as shown in the drawing, from ordinary Allen set screws.

Old-Fashioned Tailor

[*Continued from page 52*]

repair, and to construct whatever parts may be missing from additions to the exhibit.

It also is Heinrich's job to identify various types of armor when they are brought to the museum. At a glance, he can tell whether a steel breast plate or a broadsword was carried by one of the Black Knights of Germany, a Briton, or whether it was part of the fighting gear of a Viking. Identification is made principally by the designs on the metal and by the method by which the armor was forged.

In order to carry on his work, Heinrich has to be several experts rolled into one. He must know how to forge heavy metal skilfully, be able to emboss, etch, and carve, inlay gold and silver, and have an unusual knowledge of history and anatomy. It is Heinrich's boast that he can duplicate any suit of armor, or make an original, in such a manner that armor specialists cannot tell whether it was forged in 1542 or 1942. It takes him eight months, working eight hours a day, to turn out one plain, undecorated suit of armor.

He uses nothing but the ancient tools which have been dug up in various parts of Europe. Although the forge equipment seems unwieldy to the layman, Heinrich says that it is as good, if not better, than the most up-to-date of metal-shaping tools. One of the most amazing pieces of Mr. Heinrich's equipment is a gigantic pair of shears, similar to those used by modern tinsmiths, which slice through the heavy metal as though it were cloth. He uses them to cut out the various sections of a suit of armor before rounding the edges and pounding them into their final shape.

Before Heinrich can even begin the job of forging a suit of armor, he must make preliminary sketches, and the actual construction work requires the use of a living model, who must try on the heavy metal trappings for numerous "fittings."

Heinrich has discovered, in making his fittings, that the popular conception of knights as gigantic, hulking men is just so much bunk. When suits of armor are brought in, and models are needed in order properly to fit some part, Heinrich has to scout around to find men comparatively small in stature. Many of our Army and Navy men could not be squeezed into one of the outfits of the knights of old, and if they could, it would take a can-opener to get them out.

Heinrich is the one tailor in the country who can make the boast that when he turns out a suit —it never wears out.

Germs were first seen by man in 1676 when Anthony Leeuwenhoek assembled a crude microscope.

A machine which changes rubber from raw material to a finished self-sealing fuel tank lining, has been developed.

INDIAN MOTORCYCLES are in warpaint today. We've ripped off the streamlined fenders and hung on a rifle holster; we've discarded for the time being that flashy chrome trim; we've souped up the motor; and hidden those snappy two-toned colors under Army drab.

The vital point is—*they're Indian Motorcycles*... favorites for fighting as for sport. Indian's world-famous power, safety and dependability have already been proved in action on a dozen fighting fronts. *Ask the Ranger who rides one!*

When motorcycles go back to mufti after the war, there'll be new and greater Indians for you to ride. In the meantime, your Indian dealer is the man to help you keep your present machine in good shape . . . and he *may* have a dandy re-conditioned "buy" for you. See him today.

INDIAN MOTOCYCLE COMPANY, SPRINGFIELD, MASS.

BUY WAR BONDS NOW
★ ★ TO BUY AN INDIAN LATER ★ ★

A Plan For True Air Power

[*Continued from page 50*]

vessels and landing barges which is rapidly moving inshore.

But things are also moving swiftly overhead. The skies are blacked out with great air fleets, squadrons of which debouch on the air fields, and still others on the line extending across the narrow neck of the peninsula. Parachutes bloom out against the clouds and paratroopers drop swiftly on the air fields, clearing out the last enemy resistance with a chatter of Tommy guns and the sharp detonations of hand grenades while others seize the towns of Issigny and St. Germain and the railroad connecting them. In the same manner, additional shock brigades of paratroops descend on the English channel beaches before the coastal fortifications and seize beachheads, to be occupied in force later by glider troops. They are quickly followed by the transport planes and gliders, which discharge their cargoes of infantry, engineers, artillery and tanks. The line Issigny-St. Germain is lightly held with a series of strong points while the main force is concentrated against the rear of Cherbourg. As the barrage of heavy and medium bombers lifts, the fighter planes swoop low and cover the ground attack against the German fortifications on the land side with a withering fire from their machine guns and light cannon. While the attack is going forward, to the heave and thud of bayonets and grenades, the rattle of machine guns and the roar of artillery, the transport planes are busy discharging their cargoes of munitions and ground troops, the air-ground forces are already servicing and refuelling the fighter planes, infantry, artillery and heavy tank forces are being landed from the sea, and hurrying to add their strength to the attack on Cherbourg and to reinforce the line from St. Germain to Issigny. Field kitchens and hospitals, munition dumps and command posts are already established on the air fields and behind the lines.

The forces attacking Cherbourg gain entrance to the city. A white flag is raised by the German commander. Almost before the black cross German ensign flutters to the ground, a strong fleet of destroyers accompanying transports and barges, enters the harbor.

In some such fashion will the real air power of the future function, carrying out its actual function of co-ordinating its true potentials with sea and ground forces, operating in three dimensions. In some such fashion will the strong fortifications of the European fortress be taken from the rear by the aid of real air power.

* * *

For statistically minded readers, I have worked out a table of the necessary equipment and personnel which would be needed for one of the aerial divisions which we have discussed above. The table follows:

Units	Officers	Men	Heavy Ordnance	Planes	Gliders	Crews	Ground Crew
Ground Fighting Headquarters	12	16		4		16	12
1 Battalion Parachute Troops	20	500		14		56	56
1 Reg. Air Infantry	40	2,070	Trench Mortars 20 mm. AA&AT	18	100	172	72
1 Battalion Field Artillery (air)	15	450	12 75 mm. howitzers self-propelled	28		112	112
1 Battery Comb. AA&At	4	150	4 comb. 75 mm. AT&AA self-propel.	10		40	40
1 Battalion Light Tanks	16	150	12 Tanks, light	18		72	72
1 Co. Engineers	6	150		10		40	40
1 Co. Ordnance	6	75		30 (25 Amm unit'n supply)		120	120
1 Co. Q. M. Supply	6	60		33 †(30 rations & supplies)		132	132
1 Signal Co.	15	100		8		32	32
1 Headquarters Co.	5	30		(4 field radio) 2		4	4
2 Med. Co's.	32	150		24 ‡(16 ambulances)		96	96
Total Ground Forces	193	3,901		197	100	892	790

†Each man in air division to carry 3 days emergency rations.
‡In addition to Medical Officers and Hospital Corps personnel attached to each group.

Map of part of coasts of France and England.

A Plan For True Air Power

Air Forces Units	Officers	Men	Heavy Ordnance	Planes	Gliders	Crews	Ground Crew
Bombers, heavy	750	1,000		250			
Bombers, med.	500	750		250			
Fighter planes	500			500			
Tanker planes	50	150		50 (250 tons fuel & oil for fighter planes)			150
Airplane supply planes	25	40		10			30
Flying machine shops	20	100		10			100
Ground-air personnel transport	25	40			100	100	1,200
Total Air Forces	1,270	2,080		1,070	100	100	1,480
Grand Totals	1,463	5,981		1,267	200	992	2,270

Total personnel 12,168 officers and men.

I Was A Handyman Surgeon

[*Continued from page 33*]

Since I got back to the U. S. A. on leave to see my wife and son in Upper Darby, Pennsylvania, a lot of people have told me that it took a lot of courage to perform that operation under such conditions. I have an answer for that one.

"Dean Rector's the one with the courage," I say. "I wouldn't let an amateur operate on me for a million dollars."

Sassafras may prove to be a source of dyes to replace coal dyes which have become scarce because of lack of chemicals.

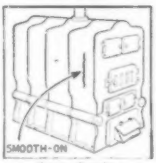
The muscles of a human being account for 40% of his body weight.

Spaniards in Mexico discovered natives waterproofing their clothes with rubber.

This country's first synthetic rubber thread, made from Ameripol has been introduced, but only for military purposes—parachutes, harnesses, gas masks, respirators.

Make your own

WAR-TIME REPAIRS



Seals Cracks

Stops Leaks

Don't worry because you can't replace a cracked boiler; or a leaking radiator, tank, heater or pipe, or a loose fixture for the duration. With a can of Smooth-On No. 1 you can make all these and similar repairs quickly . . . economically . . . lastingly. Smooth-On repairs do not require heat, special tools, or previous experience. And Smooth-On is easy to apply . . . it enables any handyman to take care of dozens of repairs around the house . . . on the car . . . in the shop.

Buy SMOOTH-ON in 1¼-oz., 7-oz. or larger cans from your hardware dealer or, if necessary, from us.

FREE 40 PAGE HANDBOOK

Get your copy of our latest 40 page illustrated handbook. Shows how to make repairs quickly, economically. Just send the coupon.

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Address .....

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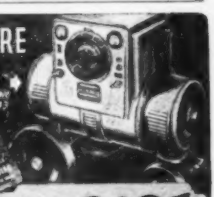
Free

Do it with SMOOTH-ON

HOBART TRAINED MEN ARE IN BIG DEMAND

Never has there been such a demand for well-trained operators. Hobart trained welders get the cream of the jobs, for industry knows they are trained in all procedures. Enroll today to get a big pay job for now and after the war.



Free Literature! Tells the story of the Hobart school. Shows how individual booths and welders are used. Outlines course.

HOBART

"One of the World's Largest Builders of Arc Welders!"

Write right away for details. The HOBART SCHOOL of ARC WELDING Box SM-53, Troy, Ohio

The Farm Of Tomorrow

[*Continued from page 67*]

which the leaf converts carbon dioxide and water into simple carbohydrates—the basic food supply of all animal life—through the energizing action of sunlight. If we could match this process or improve upon it, we could theoretically manufacture simple carbohydrate foods by bringing carbon dioxide gas and water together in the presence of a source of radiant energy, which is what the farmer does in effect through the plants he raises —rather inefficiently.

Carbon atoms made temporarily radioactive by bombardment in "atom smashers" like the cyclotron of Dr. Ernest O. Lawrence can be traced in their progress through the plant leaf. (MECHANIX ILLUSTRATED, March, 1943.) This is yielding new secrets of organic chemistry with untold possibilities. Molecules may even be put together to manufacture synthetic fuels or foods, along entirely new lines. One organic product, urea, was synthesized years ago and is now used as a cattle food to replace part of the necessary nitrogenous plant material. A weapon which may make new chemical transformations possible is the art of chemotronics — almost unknown outside a few labs—in which electronic radiation is used as a catalyst to speed chemical reactions.

Of more immediate importance in revolutionizing agriculture is the coming abundance of cheap and potent fertilizer. Wartime needs for nitrogen in explosives have led to methods of synthesizing ammonia (containing nitrogen) in such stupendous quantities that the future trend may be to smaller farms. Ammonia fertilizers may enrich worn out lands to such a degree that a few acres will equal the output of a big ranch. Lands now considered too poverty-stricken for farming may be enriched so that prosperous small farms will spring up where wastes now flourish. Enriching ammonia gas can even be blown into the soil, or added to irrigation water as in California where it has greatly increased the yield of fruit crops.

Plants, like human beings, require certain micro-nutrients for health—minerals like boron, molybdenum, zinc, magnesium, iodine. Many crop diseases once thought to result from viruses and fungi are now known to result from lack of infinitely small quantities of micro-nutrients. With electronic instruments such as the spectrophotometer, soils can be assayed quickly and the farmer supplied with custom-built fertilizers to make up the deficiencies of his particular lands.

Animal breeding has kept pace with the development of new plant species. At the great experimental farm conducted by the U. S. Department of Agriculture at Beltsville, Maryland, turkeys have been bred that are nearly all white meat, as well as poultry with oversize drumsticks. Hogs with bigger hams, yielding more or less bacon as desired, can be and have been developed by cross-breeding.

The process of artificial insemination, by which paternal germ plasm is implanted with veterinary aid into cows and ewes and mares, is fast advancing beyond the stage of experimentation. The Russians have blazed some astonishing trails in this respect. They report the history of one bull whose germ cells produce 1,000 offspring in a season, and the case of a ram with 15,000 descendants in a year. The advantage is, of course, that scrub mating can be eliminated and male stock of superior heredity used.

Farm equipment will show many changes as a result of impact of the war. Delmar G. Roos, the man who designed the famous Army Jeep, says of this four-wheel-drive automotive wonder: "It has great possibilities in agriculture where a small farm is involved, where you don't have your money tied up in a truck and in a tractor or in a power plant. When the war ends there will be many thousands of these Jeeps that can be bought from the government at low prices by the farmers."

Heavier machines—mowers, tractors, combines, reapers—will reflect the abundance of light metals, aluminum and magnesium, developed by the war. Light-weight, rustproof parts will require less fuel for motive power. Small buildings such as poultry houses and tool sheds will be available in factory-made sections that can be erected or disassembled in a few hours. The farm house itself can be a prefabricated type such as are going up by the thousands in defense centers. Windows and doors, plumbing pipes, heating units and electrical outlets are built into insulated panels and a medium-sized home can be set up

FOR THE DURATION

If your copy of *Mechanix Illustrated* fails to arrive at your newsstand on time, please be patient. Remember that the nation's transportation system is all-out for war, and that distribution of *Mechanix Illustrated* to your area may often be delayed for several days to make way for movements of fighting men and their supplies.

But remember, too that paper rationing has forced a reduction in the number of copies of *Mechanix Illustrated* that can be printed. ASSURE YOURSELF OF GETTING YOUR MECHANIX ILLUSTRATED in these days, when it is bringing you more important news than ever before, BY RESERVING YOUR COPY AT YOUR NEWSDEALER'S EVERY MONTH IN ADVANCE.

The Farm Of Tomorrow

ready for occupancy in a single day.

Inside the air-conditioned house there will be a combination radio-television set, working on FM principles which will allow wavebands for innumerable local stations so that daily marketing news, calls for loadings from community dehydrating, distilling and quick-freezing plants are almost on an individual basis. Electric eyes will set off an alarm to warn that an intruder has entered the barn, that cows have got loose and are wandering out, or that a fire has started. Ultraviolet radiation will guard the purity of milkings and Sterilamps will keep both barn and house free from many air-borne disease organisms.

Even the weather, though it will probably always resist man-made control in the great outdoors, is being tamed through reliable methods of long-term prediction. When the farmer knows what drought and rain and sunshine the growing season will bring, he can plant accordingly and to a considerable degree overcome the feast-or-famine results of uncertain weather.

The polar air mass principle is enabling scientists to predict with much accuracy what a summer's growing conditions will be. Electronic tubes in many sections are now recording the quantity of sunfall on the land and this information is helping to compile charts and tables from which trends may be forecast.

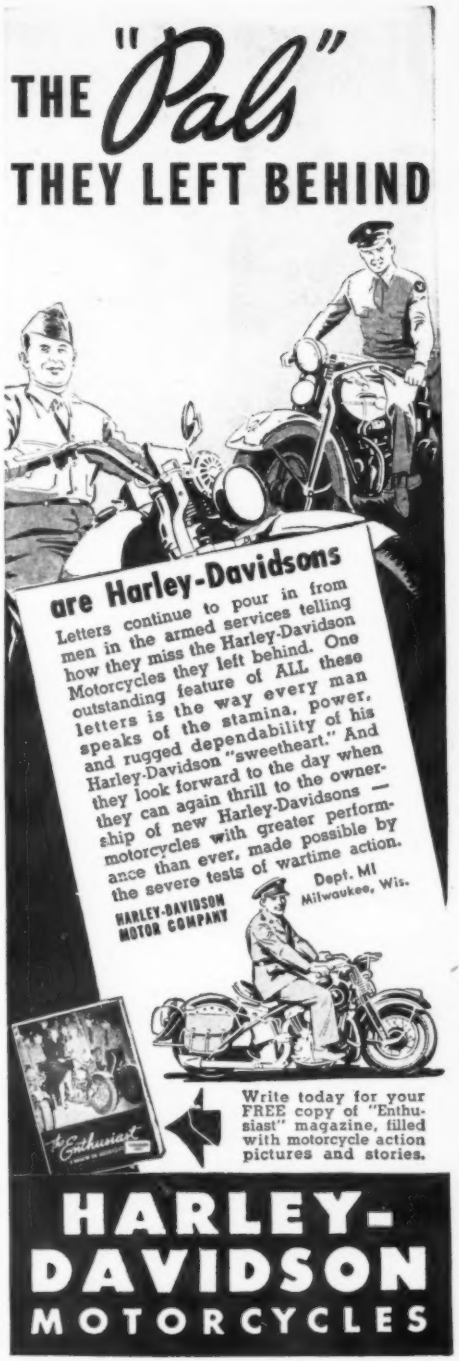
This war is being directed to no small degree by meteorologists who tell when conditions will be ideal for attack. Hitler's so-called "weather luck" which gave him ideal conditions during the invasion of France, Poland, and the Ukraine, is no tribute to his famous intuition, but to weather-skilled scientists. Don't think we haven't plenty of them on our side too! When the story can be told it will be a striking one, and we will have a vast reservoir of weather facts, compiled by meteorologists of the air and ground forces, that will mean millions of dollars to the farmer.

Then he'll plant what weather scientists tell him to plant, and when to plant it—can plan his crops a year or two in advance.

Life on the farm will become so satisfying that thousands of city workers will make their dreams of a few acres of their own come true. The whole trend of our times is toward decentralization. The war has caused factories to spring up in a thousand deserted pastures. Glider trains, family airplanes, helicopters, new streamlined automobiles, will make transportation so easy after the war that crowded urban areas will tend to sprawl out into the country. Small farms will be more numerous, and more pleasant to live on.

Within the home there will be plays and lectures by television, football games on wall-size screens, news events seen as they happen. The city apartment dweller will have no advantage in tapping these universal entertainments. A short

[*Continued on page 150*]


THE "Pals" THEY LEFT BEHIND
are Harley-Davidsons
Letters continue to pour in from men in the armed services telling how they miss the Harley-Davidson Motorcycles they left behind. One outstanding feature of ALL these letters is the way every man speaks of the stamina, power, and rugged dependability of his Harley-Davidson "sweetheart." And they look forward to the day when they can again thrill to the ownership of new Harley-Davidsons — motorcycles with greater performance than ever, made possible by the severe tests of wartime action.
HARLEY-DAVIDSON MOTOR COMPANY
Dept. MI
Milwaukee, Wis.
An Enthusiast
Write today for your FREE copy of "Enthusiast" magazine, filled with motorcycle action pictures and stories.
HARLEY-DAVIDSON
MOTORCYCLES

The Farm Of Tomorrow

[*Continued from page* 149]

wave radio set carried in your pocket—descendant of the "walkie-talkie" sets now used by American soldiers—will enable your wife to call you home to dinner from the east eighty, to relay telephone messages, even to communicate with you, through your personal wavelength, although she has no idea where you are.

It's going to be fun to live on tomorrow's farm!

Bombs For The Mind

[*Continued from page* 45]

instance, when Denmark's pro-Nazi Foreign Minister Erik Scavenius signed the Anti-Comintern Pact against the wishes of King Christian, the Germans suppressed the news, knowing that it would provoke riots. The Danes, however, learned of it from U. S. broadcasts, and a large crowd marched to the Palace, cheered the King, and hung Scavenius in effigy. A band of hardy students then adjourned to the German barracks in Copenhagen and sang "Tipperary."

Another and more spectacular propaganda triumph was the follow-up to the RAF raid on Berlin, which held up Goering's speech on Hitler's anniversary for 90 minutes. Immediately after the raid, the BBC played back to Germany a recording of Goering's famous boast that "no bomb will ever fall on German soil." Incidentally, this telling device of proving the Nazi bosses liars with their own words is used regularly by the BBC, which has recordings of every important speech delivered in Germany for the past five years.

While U. S. experts, confident that the facts speak for themselves, believe that straight news should be the mainstay of our radio offensive, America's allies—Britain and Russia—are also rubbing Hitler on the raw with other types of program. Dramatizations and informal dialogues play an important role in the BBC service to Germany.

On one series, Kurt Kruger, a naive schoolmaster, and Willi Schimanski, a hard-boiled official from the Propaganda Ministry are heard chatting at their favorite cafe. Alarmed by reports of America's war output, Kurt asks Willi: "Which is the best season for U-boats?" Willi replies: "No season at all, it seems. We learned at the Ministry that insurance companies in Switzerland estimate the average life of a U-boat man at 62 days." Kurt goes off muttering: "Sixty-two days. My God, is that all a U-boat man can expect to live?"

Russian propaganda is more personal, more brutal in its approach, but devastingly effective. "I am a Soviet war reporter," a Russian speaker begins. "The battlefield is strewn with Nazi dead, victims of Hitler's mad ambitions. Here is one of them, about 23 years old, a tall, strong, young man like your son. Here is his identification disc. His name is . . . ."

It was the Russians, too, who invented the technic of cutting in on the enemy's wave-length, thus enabling their microphone wit, "Ivan the Terrible,"—probably Foreign Vice-Commissar Lozovsky—to heckle and bedevil Dr. Goebbels' minions over the German home network.

The Nazis are making a lame showing on the radio front. The American "Haw-Haws"—Fred Kaltenbach, Robert Best, Edward Leopold Delaney, and the rest, who are shortly to be indicted for treason by the U. S. Government — are suffering from staleness aggravated by a clear case of the jitters. A collection of second-rate misfits, they seem to have lost the verve of their palmier days and do little more than mouth mass-produced propaganda cliches punctuated with hysterical outbursts of self-justification. Their last hope is to drive a wedge between the chief partners of the United Nations, and it is against this divisive propaganda that we have to be on guard.

In Europe, the prestige of the German radio has sunk so low that the Nazis have lately endeavored to obtain a hearing by broadcasting from fake "Freedom" stations, such as the "Nutcracker" in Holland. These phony outlaw stations have been quickly exposed by the BBC, and so forced off the air.

One apparently genuine pirate transmitter, "Gustav Siegfried Eins," which claims to be

AMERICA IN 1950

IF THE AXIS WINS . . .

. . . your children will be taken from you soon after their birth. In the Axis countries, children belong to the State, not their parents. They are taught to hate their fathers and mothers.

IF AMERICA WINS . . .

. . . you can live in the knowledge that your children will be brought up under the finest conditions known to man.

What kind of a future do you want for *your* sons and daughters? If it's the American variety, only your purchase of War Bonds and Stamps will guarantee it.

Bombs For The Mind

operated by associates of Rudolf Hess, has become a first-class headache for Goebbels & Co. Its explosive spokesman, "The Chief," who refers mysteriously to "close connections with the German Air Force," spends most of his time exposing, with a staggering array of facts, the crimes and corruption of the Gestapo, the Gauleiters, and the "filthy pigs" of the SS. This is radio warfare in the raw: crude, violent, obscene. Judging from the amazing accuracy of "The Chief's" military information, he has an inside track to high Nazi officials. "The Chief" anticipated the German Army's admission of typhus on the Russian front, scooped the German press by two days with the details of the latest extension of rationing in the Reich, and announced to the world the news that the Italian Ambassador to Berlin, Dino Alfieri, had been horse-whipped by a Nazi officer for seducing his wife.

Japan's wartime propaganda tactics are a clumsy imitation of Berlin's, though the Japs frequently outdo their masters at boasting, lying, and abuse. The Nipponese have a keen sense of the importance of radio. Forty-five stations of the Nippon Hoso Kyokai (Broadcasting Corporation of Japan) wage war on the ether in thirty-one different languages and dialects.

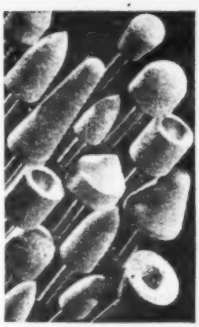
Tokio's propaganda experts are most effective when addressing the peoples of Asia. Their strategy is to depict Japan as "the true champion of the colored races and the leader in smashing the power of the white race." Thus Japan is the "true friend" of China and the "savior" of India. With these tactics, the Nipponese have had some success among the native populations of Indo-China, Thailand, Malaya, and Burma.

Against the West, Tokio's verbal offensive has been laughable. Not content with the success of their sneak attack on Pearl Harbor, Japanese propagandists exultingly announced that the U. S. Pacific Fleet had been virtually annihilated. Thus every time a major naval engagement was fought, Hirohito's zealous brainsmen were compelled to re-float Uncle Sam's Fleet so that it could again be sent to the bottom by the fabulous Japanese Navy.

Jap broadcasts for the home front dwell rather on colossal hardships. The Tokio radio betrays anxiety over food and clothing shortages and hints at a long, bloody war. "Farmers' hats," one speaker helpfully suggested, "must be made from old umbrellas, which have the advantage of being water-repellant." And the housewife is told that she can make her "pastel girlhood kimono last until she is forty years old by dying it three shades darker every six years."

The United States blankets the Pacific area with the longrange salvos of General Electric's giant transmitter, KGEI in San Francisco. Programs are aimed at listeners half-way round the world in English, Japanese, Chinese (Cantonese and Mandarin), French, Dutch, Thai, and Tagalog—

[*Continued on page 152*]



FINISH THE JOB RIGHT

Like setting the last rivet as the plane comes off the production line—burring, finishing and polishing to minute specifications mean the job is right.

CHICAGO MOUNTED WHEELS

Famous since their introduction 45 years ago for quality and long life. There is a "just right" Chicago Mounted Wheel for every operation.

PROMPT DELIVERIES—We are working 24 hours a day and due to our central location, can make prompt shipment on all Mounted Points and Grinding Wheels 3" in diam. and under. With the approval and endorsement of W P B, all our facilities are concentrated in these smaller sizes, enabling us to give the most potent service to the war program.

HANDEE TOOL OF 1001 USES and HI-POWER GRINDERS have gone to war—available to all who have priorities

FREE Catalog, shows actual sizes and colors of largest line of Mounted Wheels made.

CHICAGO WHEEL & MFG. CO.
America's Headquarters for Mounted Wheels
1101 W. Monroe St., Dept. MI, Chicago, Ill.

"EVEREADY" FLASHLIGHTS AND BATTERIES are vital equipment both at home and at the front. Serve by conserving yours!

$1,000.00
(at age 29)
LIFE INSURANCE
BACKED BY LEGAL RESERVES
only $1.00 a month

DOUBLE DUTY policy provides the largest amount of Life Insurance at the lowest cost! At age 29, policy pays DOUBLE benefits for first 5 years—up to $1000.00 for loss of life from any cause. Up to $2000.00 for travel accidental death. Pays generous graded benefits according to present age. Old Age Disability benefit included. Issued to men and women from 10 to 65 years of age. Regardless of age the premium always remains the same—only $1.00 a month. Send coupon NOW for FREE information. No red tape—no medical examination—no agents. Write today!

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MAIL COUPON NOW!

Pioneer Life Insurance Co.
5030 Times Bldg., Rockford, Ill.
Please mail me FREE details about DOUBLE DUTY Policy.

Name .....
Address .....
City & State .....

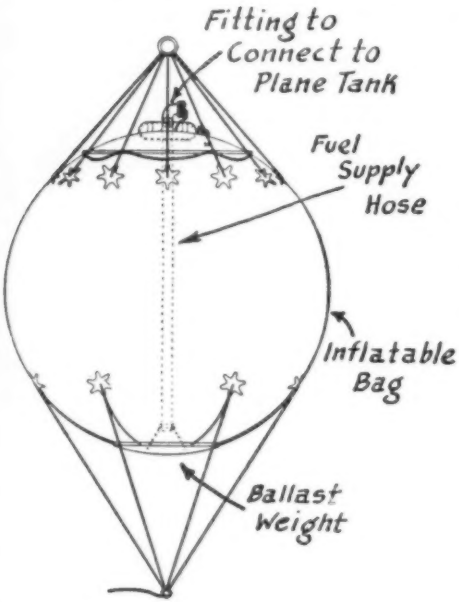
Bombs For The Mind

[*Continued from page* 151]

the language of the Filipinos. Most experts admit that at this stage our propaganda to Japan can have but little effect, since only Japanese government officials own short-wave receivers. Nevertheless, radio has a vital role to play in the Orient, since it is in direct contact with the very officials who can overthrow the Tokio militarists when the Japanese war machine begins to crack up.

Of more immediate importance is the morale-building role of radio throughout the far-flung Pacific theater. A flick of the dial brings news, entertainment, and greetings from home to U. S. fighting men in New Guinea and the Solomons, in India, Australia and the swamps of Burma. Here too, radio justifies its designation as the "fourth arm" of America's war effort.

Popular Patents

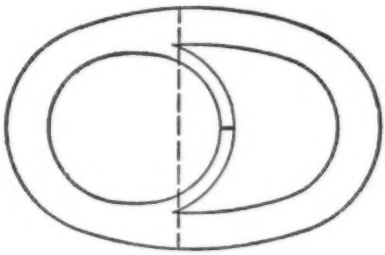


An improved fuel delivery buoy for rapidly refueling a fleet of patrol planes has been invented by Paul E. Pihl and Charles F. Coe of the United States Navy. Faced by the problem of having planes await their turn to take on fuel when only a single fuel tender was available, and realizing that in times of emergency the patrol must be kept in active operation, these men designed an inflatable bag for carrying sufficient fuel for a plane. A sufficient number of buoys are used to supply every plane of the fleet. The bag is made preferably of artificial rubber-impregnated fabric and measures about 6½ feet in diameter. Extending through the top of the bag is a fuel supply hose by means of which a fuel tender fills the bag while the fleet is on duty. A cylinder of compressed carbon dioxide is connected to the top of the bag to inflate it before refilling with fuel. After filling, a second charge of carbon dioxide is placed so as to fill the bag as the fuel is removed, thus preventing a collapse of the bag. Due to the difference in gravity between the fuel and sea water, the bag remains afloat. Free use of the invention to the government has been granted. (No. 2,287,824.)

* * *

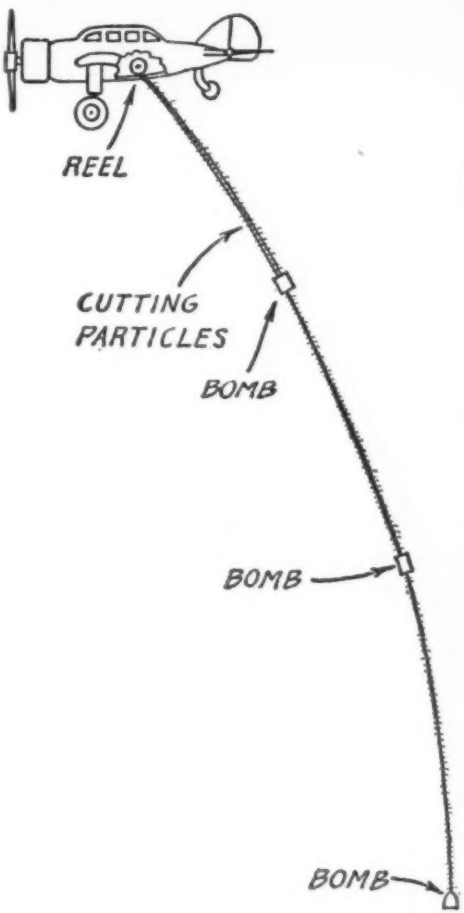
An ingenious application of a magnet resulted in a patent for Grace Draper and Viola Randle of Sonora, Texas. To provide a receptacle for holding hair dressing pins and bobbie pins within easy reach of a beauty operator, the inventors devised a pin tray with a magnet having its poles inside the bottom of the tray to retain the pins. The tray can be fastened to the shoulder of the person being treated. (No. 2,283,543.)

* * *



With the introduction of "Standsit" seats for buses in crowded Washington vehicles, a new type of headrest for travelers comes to our attention. The device consists of a blank of resilient or elastic self-sustaining material of substantially elliptical annular form. The blank has a central opening for fitting around a person's neck. An outer portion is adapted to be bent forward to be placed in the angle between the chin and the upper portion of the person's neck. In this position, the device rests upon the upper part of the chest and the upper part which has been bent forward presses upwardly against the chin to keep the head erect. The unit may be cut or otherwise stamped from rubber or the like. The inventors are Henry Kaiser and Leo Kaiser of Ronan, and George Shepard of Missoula, Montana. (No. 2,284,058.)

Popular Patents



Sidney Johnson of Birmingham, Alabama, would literally cut an enemy airplane right out of the sky with his newly patented weapon. His device includes a long, flexible cutting cable which is suspended from an airplane. The surface of the cable is coated with abrasive particles, such as flint and high carbon steel. At intervals along the cable, contact bombs are fastened. When the airplane takes off, it gains a desired altitude above an enemy airplane. Then the cable is lowered. When the flexible cutter contacts the opposing aircraft and is drawn rapidly across it, the cutting edges damage the enemy craft. At the same time, the cutting particles produce sparks for possibly igniting the fuel of the enemy plane. If luck is really good, one of the contact bombs will strike the plane to insure a thorough destruction of the plane. (No. 2,299,327.)

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Specialists In Snow

[*Continued from page 70*]

has a length of 350 miles and a drainage area of 14,200 square miles above Humboldt Lake. A formidable undertaking indeed. But well-considered methods simplify a task that appears almost impossible.

It has been found that 90 per cent of the water of this vast Basin is furnished by two parallel mountain ranges, eighty miles apart. Thus, total run-off can be determined with a fair degree of accuracy by running relatively few snow survey courses in either range; for these serve as an index for the watershed as a whole. It is something like the scale of a map. But as in the case of a map the snow surveyor must never forget that a tiny error in the scale becomes an enormous error in the whole.

The work of the survey crews of the California Cooperative Snow Surveys is typical. Bundled up in warm clothing, mushing into the high snows on either snowshoes or skis, they carry strapped to their packs lengths of metal tube—30 or perhaps 60 inches long—presently to be assembled to the depth of the snow. If this happens to mean a depth of twenty feet, as is possible, the sections fit together to make an implement that looks like a twenty foot drain pipe.

Among their equipment is a set of scales for weighing the snow samples taken, plus waterproof paper for writing down data and a sketch map showing the layout of each snow course to be measured. These courses have been chosen in summer when the ground was bare, in order to avoid fallen trees, stumps or irregular depressions that might alter the accuracy of picture as a whole. The number of sampling stations depends largely upon the nature of the snow; if it lies evenly, a few "shots" will tell as much as many. But if the snow has drifted badly it may be necessary to take 25 or even 50 samples on a given course. Thus error in the estimate of the entire cover is avoided.

Arrived at a station, the crew assembles the metal tube and weighs it empty on the scales. The weight is recorded. Then the tube is shoved vertically down into the snow pack. Maybe it slips down easily, maybe it doesn't. There's a wrench on top to turn it to overcome obstinate layers below. Sometimes the snow proves so recalcitrant surveyors have to resort to what they call "tickling" the tube. It can't be forced, insists upon taking its own good time. The tube is allowed to penetrate at a gradual rate, with only slight pressure applied.

Experience is required to know when tube has at last penetrated the snow pack and come into contact with ground. Experience also suggests the type of ground. Surveyors speak of a "slick greasy feel" if ice is there. Grass, roots and rocks register a grating roughness, while mud tells of its presence by being "gummy." The nature of ground directly affects the final calculations. The operator reads the depth of snow on gradations marked on tube, and checks it against the length of the snow core inside.

The entire tube is hauled up. Foreign objects such as grass, dirt and matted leaves are usually found clinging to the bottom of the snow core. These are carefully scraped away, and the tube with its complete core is placed on the scales and weighed.

Measurements, weights and various details that could have any special bearing are duly recorded and also sources of possible error. In some localities, especially the East, it is customary to resort to thermometers and magnifying glass as well. The thermometer is shoved down about a foot into the snow pack, the temperature being some indication of when the spring break is due and the possible magnitude of floods.

The magnifying glass is used to study snow crystals. Their varying sizes and shapes serve as

AMERICA IN 1950

IF THE NAZIS WIN . . .

. . . even our rationed supplies of autos, gas, sugar, oil and clothing, will seem like paradise. For, under the Axis, such commodities will go only to the chosen few—all loyal Nazis and Japs!

IF AMERICA WINS . . .

. . . our present autos, foods and clothing will be obsolete, for progress will bring us such developments in these fields that we'll virtually be living in a dream world. If you want the Nazi way, then don't support your government; but if you want the American way, start buying your share of War Bonds.

THE MAN WITH THE 1,000-PLANE PUNCH!

He's the man who mapped the greatest air raid in history—the R. A. F.'s smashing 1,000-plane blasting of Hitler's Cologne. He's the man who followed that up by directing the greatest aerial offensive in history—the R. A. F.'s battering, night after night, of one Nazi stronghold after another—Lubeck, Wilhelmshaven, Emden, Nuremburg, and even Berlin itself! He's the man who says that "the Germans will look back to those days as men in a typhoon look back to a gentle zephyr."

Who is he? Air Marshal Sir Arthur Travers Harris—chief of Great Britain's hard-hitting Bomber Command. Don't miss the full-length story about him—in the June issue of MECHANIX ILLUSTRATED, ON SALE EARLY IN MAY. RESERVE A COPY AT YOUR NEWSSTAND NOW!

Specialists In Snow

indications of their saturation points and how much water the snow will absorb before a run-off is to be expected.

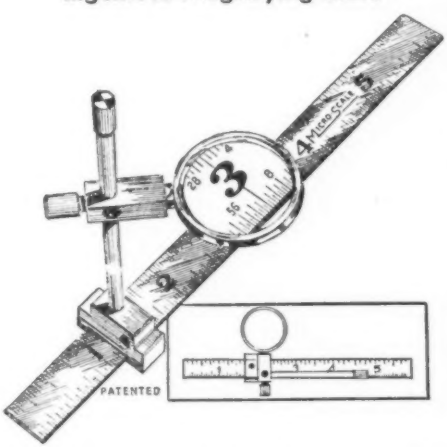
After all necessary data concerning one sampling station has been recorded, the crew moves on. The tube is held up to the sky for assurance that it is clear of snow. It is then weighed empty and shoved down as before. The density showed by this recording probably won't vary much from the first. If there's a marked difference, as sometimes happens, another sampling is made about a foot away by way of check. From all these samplings a mean density is later recorded.

Only when all the courses have been covered, do complicated calculations, based on the field determinations, begin to yield significant and important predictions—predictions upon whose soundness depend not only much farm production, but power output and even many lives. Thirty years ago some people out in the West thought Dr. Church was crazy. They don't think so any more.

Australian housewives are experimenting with a scorched wheat substitute for tea; Australians drink 10 times as much tea as Americans.

A tiny pictorial map on a cigarette case guided 17 American airmen piloting several U. S. flying boats in an escape from the Philippines to the Netherlands Indies.

Ingenious Magnifying Scale



An ingenious tool which has been developed for defense plants, known as the "Micro-Scale," consists of a standard machinist's scale divided into tiny 64ths of an inch and a magnifying attachment. The magnifier is a patented plastic lens mounted on a slide block which is used to check the length of parts, depth of holes, center distances in layouts, finishes of metal.

The enlarged divisions are easy to read, enabling work to be done faster and closer.

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Wood workers: *Here it is!* Harold Hunt's big REVISED No. 14 wood catalog! Latest, UP-TO-DATE IDEAS for experts and amateurs! SPECIAL BARGAINS in rare woods, veneers, and all kinds of supplies. 124 pages—12 showing rare woods in color. Get posted! Send only 10c to Craftsman Wood Service Co., 2729 S. Mary St., Dept. G-33, Chicago, Ill.

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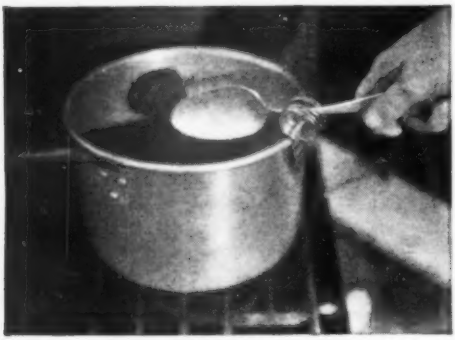
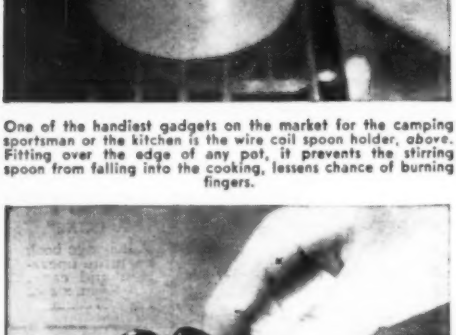
New Products



One of the handiest gadgets on the market for the camping sportsman or the kitchen is the wire coil spoon holder, *above*. Fitting over the edge of any pot, it prevents the stirring spoon from falling into the cooking, lessens chance of burning fingers.



Above. This new, swiveled iron cord set prevents bending, twisting and kinking of line cord as iron is moved around in use. The swivel and plug meet at readily movable electrical contacts.

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Fish That Spits In Your Eye

[*Continued from page 57*]

especially when the light is not good. This is a use of the defensive rule of camouflage that is almost aggressive.

The hornet butterfly is another mimic, its pattern for imitation being the true hornet. The harmless butterfly has transparent wings setting off a body shaped like a hornet's, and is even able to make a hornet-like buzz in flight.

But perhaps the most remarkable feat of all in this varied warfare is that of a small sea snail, which actually arms itself with weapons taken from its victims. The plant-like fish called the sea rose is a favorite feature on the menu of this snail; but the sea rose is armed with a growth of nettle capsules—hollow poison-filled bristles, which break off against an attacker and inject a painful, even disabling venom. Somehow or other, however, the snail often succeeds in breaking through this defensive armament, to eat the sea rose, including its nettle capsule buds. These embryo capsules are transferred in the snail to its hollow appendages, where they then grow to full size and potency, and the snail is full-armed with the weapons of its late conquest! No army, using captured tanks and guns to increase its own power, could digest and adapt to its uses enemy weapons more efficiently.

Vitamin B_1 is now used to render insulin-shock treatment for mental disease safer and more effective.

The star, Canopus, emits more than 2,500 times as much light as the sun.

One-fourth of the 16 most powerful lighthouse lights are in Hawaii.

After the discovery of the use of fire, the next great step forward by man was the taming of plants and animals.

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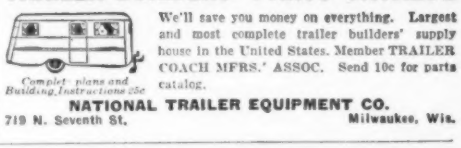
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Editor's Workbench Chips

[*Continued from page 33*]

earth down into a form you're molding bricks and building up the walls with them. Anyway, turn to page 122 and decide for yourself.

We wish there was room to print *all* the letters received from readers who are enjoying the "Modern Houses of Earth" series; there isn't, of course, but here's one from a man who may be considered somewhat of an expert in the housing field:

"Gentlemen:

The first article, in your March issue, on Modern Houses of Earth, by Richard W. Haupt, is a dandy. For some years past I have followed housing articles, part of which time I worked in a Federal Housing Agency, and can say that you have attained a 'high' in having Mr. Haupt do this set. This type of article rightly belongs to permanent literature in presenting housing construction techniques.

Yours sincerely,
J. H. Rhoads
Senior Economist
Bldg. Materials Branch
War Production Board."

Mind if MI takes a bow, along with Mr. Haupt?

Incidentally, a lot of you want to know where you can get more information on earth houses, and where you can obtain the asphaltic emulsion mixed with the earth. Here's the dope:

Farmer's Bulletin No. 1500, put out by the Department of Agriculture, Washington, D. C. gives information. It's free.

The Farm Security Administration, Washington, D. C. may also be found helpful.

Lewis Asphalt Engineering Co., 30 Church St., New York City can supply the emulsion.

The Army Is Buying Cameras

A VARIETY of motion picture cameras, projectors and accessories, and several types of still photography equipment are urgently

MODEL K FORD FROM MI PLANS

Evan McClennan, 86 Pinewood Ave., Toronto, Ont., is the builder of this model of the Model K Ford. Mr. McClennan used MECHANIX ILLUSTRATED plans for the job. A $3.00 Workbench award and a Certificate of Merit go to Mr. McClennan.

Editor's Workbench Chips

needed by the Signal Corps, Army Services of Supply. Amateurs are urged to help the Nation by offering for sale any equipment on the "wanted" list which they may happen to own.

The list (No. 24-11180), which may be obtained by writing the War Department, Bureau of Public Relations, Washington, D. C., includes motion picture cameras, animation cameras, projectors, sound reproducing equipment, printers, and film examining machines—for both 16mm and 35mm motion picture film and film strips; also certain high speed still cameras and high quality exposure meters, filters, tripods, and ferrotype tins.

Used equipment can be offered if it is in perfect working condition or can readily be restored to such condition. The price paid for each item will be set by a Signal Corps inspector.

Save Those Tools!

WHEN your high speed steel cutters are "worn out," don't scrap them. They are still good—on the same job—usually for several times the original life of the tool.

The simple way to reclaim these tools is to braze tips of Carboloy to the cutting surface of the tool, letting the tip project slightly beyond the edge of the tool and then grinding the tool to size. Now when the tools wear undersize—they will probably take a lot longer to do this than did the original tools—they can be brought back to size by moving the tips out slightly. To do this, heat the tips until the braze is loosened and then move them out enough for regrinding.

This procedure of tipping high speed steel tools may be followed, as a matter of fact, not only for the purpose of reclaiming such tools when they are worn out but actually before the tools are completely undersize. Even new tools in stock may be tipped when it is desirable to convert operations immediately to carbides for increased production.

JON ROBERT'S BARN

Old lettuce crates, apple boxes, and coffee cans provided most of the material for this model house and model barn, built by Harold Dotson, of 1502 Davis Avenue, Corning, Iowa. Mr. Dotson's small son, Jon Robert, is shown seated between the two model buildings. This snapshot brings Mr. Dotson a $3.00 Workbench award and a Certificate of Merit.

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Assault Carrier

DESIGNED to paralyze and pulverize hostile tank forces, this Assault Carrier is the most recent invention of Martial and Scull, New York industrial designers, released to MECHANIX ILLUSTRATED. It is a powerful super-tank, with great tactical flexibility, intended solely for offensive use.

With armor heavy enough to withstand even a direct hit by as big a shell as 155 mm., the Assault Carrier could smash through virtually any enemy defense line. Enemy pillboxes or tanks would be demolished by the Carrier's 105 mm. turret-mounted guns.

Once well into hostile territory, the Carrier's tactics radically change. An armored ramp swings down from one side, and out over it rush perhaps 24 specially trained and equipped troops, comparable to paratroopers, to blast communications and ammunition or supply depots.

A portcullis at one end of the Carrier opens, to emit a small, fast tank destroyer, armored, mounting a 3-inch (75 mm.) gun. Swiftly this tank destroyer moves to cover the assault troops against any enemy tanks or troop units which might be lying hidden from the Carrier itself. The Carrier closes its ports again, and follows the action, keeping moving to make itself difficult for hostile artillery to hit, and covering the assault troops and tank destroyer with its big guns.

Meanwhile a force of standard tanks, mobile artillery and infantry would launch an attack of their own, to exploit at once the disruption of enemy communications and supply lines, and take advantage of the confusion and surprise caused by the Carrier's commandos. These, their mission completed, would go back into the Carrier and rejoin their own forces.

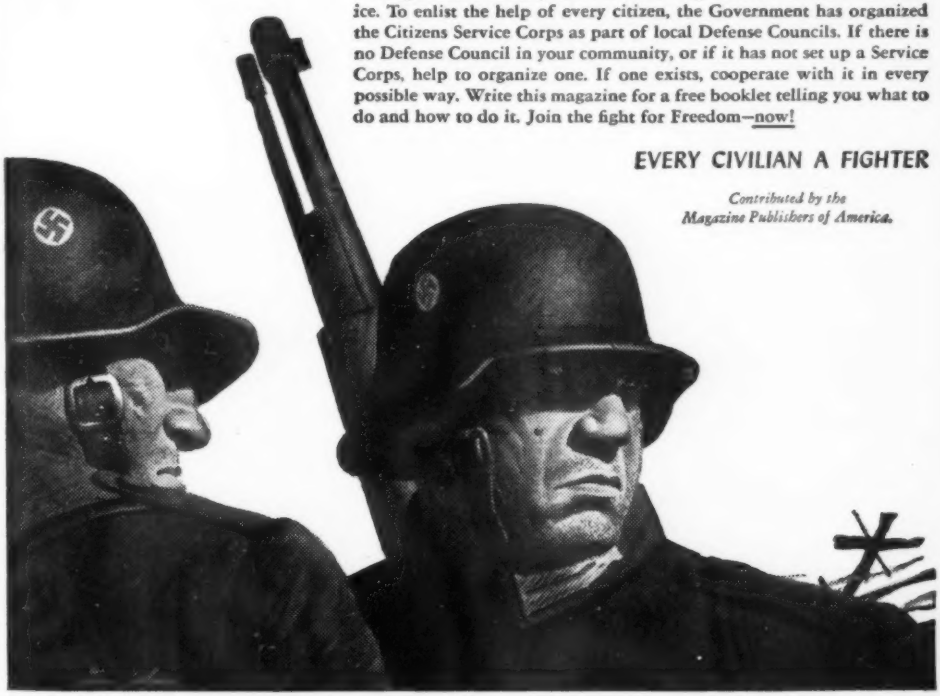
If they win ...only our dead are free

These are our enemies.
They have only one idea—to kill, and kill,
and kill, until they conquer the world.
Then, by the whip, the sword and the gallows, they will rule.
No longer will you be free to speak or write your thoughts, to worship God in your own way.
Only our dead will be free. Only the host who will fall before the enemy will know peace.
Civilization will be set back a thousand years.
Make no mistake about it—you cannot think of this as other wars.
You cannot regard your foe this time simply as people with a wrong idea.
This time you win—or die. This time you get no second chance.
This time you free the world, or else you lose it.
Surely that is worth the best fight of your life
—worth anything that you can give or do.

Throughout the country there is increasing need for civilian war service. To enlist the help of every citizen, the Government has organized the Citizens Service Corps as part of local Defense Councils. If there is no Defense Council in your community, or if it has not set up a Service Corps, help to organize one. If one exists, cooperate with it in every possible way. Write this magazine for a free booklet telling you what to do and how to do it. Join the fight for Freedom—now!

EVERY CIVILIAN A FIGHTER

Contributed by the Magazine Publishers of America.



Your Wartime Car

by Frederick C. Russell

If you have a problem with your car, ask Mr. Russell. Just send a stamped, self-addressed envelope for a personal reply.

With present restrictions on use of my car would you advise a valve job this spring? S.S.N.

Yes. You'll find this a good investment in gas mileage. But use the car wisely after it. Avoid short runs. At least get the engine warmed up before stopping to park the car.

Try it!

Harsh brakes may be due to bad lining, loose backing plate scored drums and other conditions requiring service work of a more extensive nature, but first try readjusting the brake shoes. This often provides the right answer.

Is it always advisable to reverse flush the radiator? Wm. S. F.

No. Pressure flush through the top first, for most of the sediment collects at the bottom. Sometimes reverse flushing simply forces sediment upwards into the center and top of the radiator, and thus serves no good purpose.

Ever since I had bearing work done on my car the oil pressure gauge flutters as it would with too little oil. S. N. N.

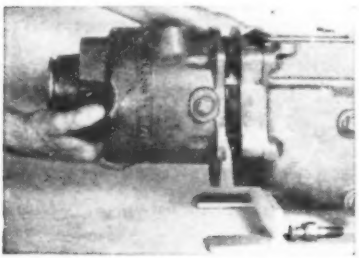
The stop for the floating oil screen evidently has been bent so that the float can't drop low enough when the oil level drops.

How can I tell if the battery is hooked up wrong after being put back into the car? N. J., Jr.

The ammeter will register charge when it should read discharge.

What causes oil to work up around the distributor shaft? V. Mc. K., Jr.

If the crankcase is overfilled with diluent or oil, and if the breather pipe is clogged, enough pressure will build up to force oil up around the shaft, especially if its oil retainer needs replacing.



Since a transmission job there has been a queer noise in the clutch of my car. What would cause this? B. W. M.

It is always a good idea in such cases to loosen the bolts which hold the major units together and try to realign them by tightening them again. The accompanying photo shows a serviceman realigning the overdrive unit with the transmission.

What adjustments can be made to cure brake "fade"? S. J. V.

The only remedy for this is to install better lining.

What can be done when the only available jack is too high to slip under the axle? E. M. K.

Run the wheel up on your bag of tire chains. That will raise it enough to slip the jack under.

I can't seem to find out what causes the engine to overheat. Have tried everything. H. B. B.

How about the cylinder head gasket? It may be allowing hot gases to leak into the cooling system.